ELECTRICAL REVIEW

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VIEWS, NEWS AND INTERVIEWS.

It has been shown that the word "Hello," spoken into a phonograph produces about 5,000 distinct vibrations. Each of these vibrations is capable of producing one Morse signal. Why not equip one telegraph line with 5,000 telegraph operators and let each send a message? Or better yet, duplex the line and use 10,000 operators.

Of all electrical apparatus the telegraph has made least progress during the past ten years. What improvements may be stored away in the form of patents, in big safes, no fellow will tell.

The electric elevator is making things lively for hydraulic and steam elevator men. There are over 100 electric elevators in actual service in New York city alone.

"Our old friend, Mrs. Ramsbotham, was reading the other day a letter in the *Times* about 'Electrical Tramways,' when she came upon a line stating that 'two naked conductors' would be used. Much shocked, she was about to look at something else in the paper when she noticed that 'one of the conductors was to be carried on poles and another to be 'laid rigid between the rails!' Horrified at this apparent brutality, the worthy lady has been writing letters (in draft) to the commissioner of police ever since."—*London Punch.*

At a recent meeting of the New York police commissioners, the question of providing steam launches for the men of the steamboat "Patrol" was discussed. Commissioner Voorhis said that the reason he had not advocated the providing of steam launches was that he had been following the experiments made in boats on the Thames and the Seine, where electricity was the motive power. He thought the board should await the result of these experiments.

Judge—Well, officer, who is this person, and what is she charged with?

Officer—Sure, it's the "Magnetic Girl," your Honor, and she's charged with electricity.—*Puck.*

It is said that a Philadelphia lady went into a Chestnut street florist's shop and asked him to let her see some nice, large electric light plants.

Traveling salesmen are not very favorably disposed toward the telephone. After quoting prices or selling goods to one concern they are likely to learn that other concerns in the same trade have been informed of the prices or sales, and that the information hampers them in their subsequent efforts to sell.

A New York jeweler has a clever electrical detective for preventing articles of jewelry from being stolen from the trays while they are in the cases, or when a salesman is showing the articles in a tray to a customer. Electricity is the agency used. In the bottom of the show case are a number of copper strips connected with electric batteries and an alarm bell. On the bottoms of the trays are copper strips corresponding with those in the bottom of the show case. Each article of jewelry in the trays is held in a small spring clip, and the article holds the two points of the clip from coming in contact when the piece of jewelry is in the clip. As soon as it is removed, however, the two points coming in contact form a circuit and an alarm bell rings. If the tray is taken out of the case and one of the articles is removed, the bell rings immediately when the tray is returned to its place. The salesmen have little wooden pins which they stick in between the two points of the clip to prevent the alarm bell from ringing when they wish to remove a piece of jewelry.

Earl Russell, of unwholesome notoriety, is to lecture on electricity. He is said to be practically acquainted with his subject, and he has proved his ability in the courts of London for giving shocks.—*Baltimore American.*

Westinghouse.

People close to the management of the Westinghouse Company say that the contracts at present on hand aggregate over $1,000,000 and that the business is steadily growing. The company's debt has now been all cleaned up and there is ample working capital in the treasury. The officials estimate that the business for the current fiscal year will reach $4,000,000 at least, or fully 50 per cent. more than last. The relations of the company with the Thomson-Houston people are better now than ever before, and there are plenty of people who believe that these two big corporations are bound in time to come closer together.—*Journal of Finance.*

Better than Ever This Year.

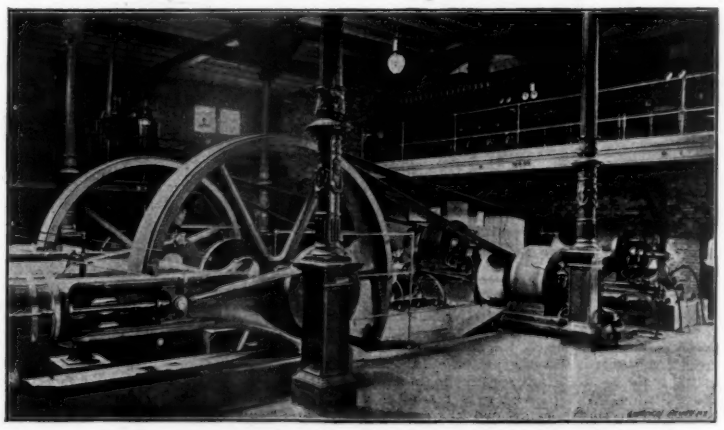
[From the Baltimore *American.*]

The most satisfactory journal of practical electricity in this or any other country is the ELECTRICAL REVIEW, of New York. It is a weekly which has grown steadily and rapidly in genuine merit. Since Mr. Charles W. Price assumed the editorship it has made great strides in every direction. Its largest value consists in its comprehensiveness. It gives a real review of electrical progress and invention; it is always newsy, and it is never dull. Its growth has been step by step with the wonderful development of the electrical industry. Next year it promises to be better than ever, and that means a great deal.

Central Station at The Hague, Holland.

This station was designed and constructed by Siemens & Halske, of Berlin, and is now under the management of the Nederlandsche Maatschappij voor Electriciteit, Haag. It was placed in operation in July, 1888. The three-wire system of distribution is used. Single and double conductor cables of Siemens & Halske are placed underground, the total length being 18,000 metres. The greatest distance from the station, at which current is supplied to consumers, is 800 metres. The potential on the line is 110 and 220 volts—the dynamos being constructed for 120 volts and two in series, giving 240 volts. The engines are four in number, and have a capacity of 630 horse-power. Two are horizontal twin engines, built by Robey & Company, of Lincoln, England, and the other two are vertical compound engines built by Geh. Stork, of Heugelo. The horizontal engines drive four continuous current dynamos by belting, their capacity being 39,600 watts (330 amperes at 120 volts). The vertical engines are coupled direct to four direct current machines having a capacity of 96,000 watts (800 amperes at 120 volts). The accumulator plant is of the Tudor system and will supply 32 horse-power.

FRANK C. PERKINS.



CENTRAL STATION AT THE HAGUE, HOLLAND.

A Model Electric Lighting Plant.

The steadily increasing popularity of electric lighting in private and commercial houses is well demonstrated by the amount of business being handled by the Cleveland Electric Lighting Company, of Cleveland, Ohio.

Large as is their present establishment, it is still far too small for the demands made upon it, and the company are contemplating extensive additions, which will probably be made early in the coming year.

Their present plant consists of a large three story brick building covering an area of 10,000 square feet, the first and second floors of which are compactly filled by the engines and dynamos, the third story being used as a workshop and storeroom.

The Thomson-Houston system is used entirely and has proved more than satisfactory under the heavy strain to which the machines are subjected.

Besides 16 Thomson-Houston arc dynamos, running from 30 to 45 lights each, there are two alternators, one of 1,200 and the other of 1,350 lights, and eight 110 volt incandescent machines of 600 lights each. An idea of the way these machines are driven may be gathered from the fact that the 1,350 light alternator is often run up to 1,900 lights.

The driving power consists of one Cooper-Corliss engine of 600 horse-power; one Hamilton-Corliss of 500 horse-power; two Armington & Sims engines of 150 horse-power each, and two Westinghouse of 90 horse-power each. An additional Armington & Sims engine of 400 horse-power is now being put up.

One of the Corliss engines has a driving wheel 18 feet in diameter, with a belt surface of three feet nine inches and the other a 20 foot wheel with a three foot belt surface. Both are run 73 revolutions per minute, with a boiler pressure of 110 pounds.

There are eight boilers, fed by two duplex pumps, which develop on an average about 1,200 horse-power.

There is also one Webster open heater and two pressure heaters of the Berryman type.

The line shafting and clutch pulleys are furnished by the Hill Clutch Works, of Cleveland, and are giving most excellent service.

The plant is located in the very heart of the city and furnishes all the lights used within a radius of a mile.

The American Chemical Society.

In response to an invitation extended by the chemists of New York, the American Chemical Society will hold its fourth general meeting in the University building, Washington Square, in this city, Tuesday and Wednesday, December 29 and 30, 1891. The Society has an actual membership of over 300, which is rapidly extending both by combinations with local societies and by the election of new members. The membership is distributed over the entire country, and representatives from nearly every section are expected to attend the forthcoming meeting.

The third general meeting of the Society, lately held in Washington, resulted in a union of all the chemical societies in this Society, and the interest in it is, therefore, rapidly increasing. Invitations have been extended to all chemists of the country, whether members of the Society or not, to attend this meeting, and in many respects it will be one of the most important gatherings of chemists ever held in the United States.

The committee of arrangements, in order to provide for the entertainment of members and others from a distance who will attend the meeting, desire to be informed at once with regard to the number of persons who will be present. They, therefore, hereby earnestly request that all those intending to come to New York for the meeting will send word to that effect to the recording secretary, Durand Woodman, 80 Beaver street, New York.

From present indications it appears that the attendance will be a large and representative one. It is further requested that those who have papers to read at this meeting will send titles and abstracts thereof to the secretary at once. Provisions have already been made for visits to various places in and about New York which are of interest to chemists.

PRACTICAL NOTES ON THE REFLECTING GALVANOMETER AND ITS ACCESSORIES.

BY J. D. BISHOP.

VI.

CONTROLLING AND DIRECTING MAGNETS.

When it is necessary to hang the galvanometer in the manner above described, it will be best to abandon all use of its directing magnet and it must, therefore, be removed. The suspension of the galvanometer will be so delicate that it will be impossible to touch the magnet without setting the whole system in a state of vibration which will require valuable time to come again to rest.

Other directing magnets will, therefore, be required. We will now describe how they may be most easily made; instructions for using them will follow in due course.

Get three or four old files, from six inches to ten in length, width and thickness immaterial. File a notch at the shoulder of the "tang" and break it off. Rough down the corners, edges and faces on an emery wheel or grindstone so as to make an easily handled bar. Heat and chill glass hard. Magnetize by drawing one end several times across one pole of a horse shoe magnet and the other end across the other pole, or a momentary touch on the poles of a dynamo will do.

No particular care is necessary in this operation, provided that the ends of the file alone are magnetized or touched on the dynamo. If an inexperienced operator tries the usual single or double magnet touch shown in the text-books, he will in all probability establish one or more "consequent poles," which would be a source of considerable trouble, when it comes to using them.

They are only required to have a feeble amount of magnetism and this must be resident as near as possible in the extremities. This is not more than five minutes' work. Now wrap them in lead by folding thick foil or thin sheet lead around them and hammering it down close and solid.

Care must be taken, however, not to hammer them too forcibly, or, being brittle from hard tempering, they may snap in two. In all probability the hard tempering will have "sprung" them a more or less curved shape, which should be retained when lead covered. With a few blows, hammer down the lead at one end of the concave side between the two corners so as to form of them two points of support and the opposite end bring to a kind of center by hammering down the corners, so as to make a kind of arched bar resting on three points. This is but a few minutes' work and the result is that you have a heavy mass resting on three points which will neither rock nor change its position easily when once placed.

As you will often be called upon to move these magnets to an almost infinitesimal extent, you will find it easier to slightly move this heavy weight than a lighter one.

Determine with an ordinary compass which is the similar pole in each of your magnetized files and mark it so that it may be easily distinguished. It is immaterial which end is marked so long as all are marked alike. A piece of white paper or small label gummed on makes a conspicuous mark.

To use these magnets will require no great cleverness, but a great deal of care and delicacy of handling. We will suppose that the galvanometer's adjusting magnet is removed and your needles are lying under the influence of the earth's magnetism alone. They are now probably useless for practical working, on account of their extreme sensitiveness, which must be reduced. Take care to remove all iron or steel from your clothes; hats are often the cause of much unsuspected trouble, their rims being stiffened with a steel or iron wire.

Light the lamp and stick up a sheet of white paper or cardboard, about a foot wide and three feet long, to receive your spot. Now take up a position about 45 degrees from the axial line of the coils and about six feet from them hold one of the magnets, which we will designate the controlling magnet, with the marked end pointing towards the galvanometer.

Approach the magnet inch by inch until the spot begins to move. If it moves from you the marked end of your magnet will be of the opposite denomination to that end of the galvanometer needle which is nearest to you. This is just what you want. If the spot moves towards you just the opposite will be the case, and you will have to reverse your magnet.

It is hardly necessary here to inform the reader that poles of similar nature, say, two marked ones, repel each other. But reinforce each other's effect on the needles of the galvanometer, or what is better to our purpose, poles of dissimilar character, or one marked and one unmarked, attract each other and stultify each other's effect.

What we want to do now is to "tie the mirror down" as it is termed, so as to reduce its sensitiveness to within practical limits.

Now withdraw from your position and place your controlling magnet immediately in front of the galvanometer, and, say, three feet from it, and at right angles to the axis of the coils, so that the marked end of your magnet points to the side you were on before, and gradually slide it along the table broadside on towards the galvanometer. As it approaches it will be found that the oscillations of the spot become quicker and more decisive. If, however, they tend to move off to the right or the left the motion must be counteracted by a corresponding longitudinal movement of the magnet across the axial line.

By careful and steady watching the spot and approaching the magnet to within a few inches (say, six to twenty-four, according to its strength), the oscillations of the spot will be reduced to a quick, tremulous motion resembling the vibration of a spring. Bring the magnet up as close as you can to the galvanometer without touching the suspension frame and adjust it so that the spot falls on the center of the cardboard or rather directly on the axial line, by moving the magnet slightly in the direction of its length, either way as required.

When the spot is as approximately central as you can make it, draw the outline of the magnet on the table so that it may easily be replaced if accidentally moved, and number both magnet and outline for future reference, the numbers being placed on the marked end. It is as well, perhaps, here to caution the operator that his lamp must be over the axial line.

The galvanometer is now tied down so tightly that it is practically useless for actual work, but it will be found quite sensitive enough for all purposes required in the further process of bringing the whole of your apparatus to working completion, and we will, therefore, leave it as it is for the present.

The next important matters are the scale and lamp. These are generally supplied with the galvanometer, and often designed to give the operator the greatest amount of trouble possible. The radius of the spot or the distance from mirror to scale, and the divisions of the scale so small that reading is tiring in the extreme, or if provision is made for a longer radius the operator's work is rendered still more unsatisfactory by having to squint through a telescope and give one eye double the work and the brain double the tension required by even the former system.

If the reader takes my advice and wishes to work with perfect ease and comfort, he will sacrifice the highly scientific appearances of his polished mahogany and highly lacquered brass work and set to work on something more sensible and practical. When at leisure in the future he may install the original lamp and scale for his own home-made one, and see which he prefers to work with. Or he may follow the instructions given in the usual text-books or sent with the instrument and get his experience therefrom before making his own lamp and scale.

In the case of absolutely no prior knowledge of setting up galvanometers perhaps this would be the better method, otherwise the operator may proceed as follows.

THE LAMP.

Lamps usually provided are too small in the wick to give light enough and too small in the reservoir to keep up even that light long enough. There is nothing so wearisome as a badly trimmed lamp or a well trimmed one going out in the middle of a piece of work for want of oil. If there is no reason why one should read a book by the light of a tallow candle instead of a bright sufficient light if one is available, there is still less reason why one should be compelled to perform galvanometer work with a miserable little cheap lamp throwing a feeble spot on a millimetre scale whose figures even in broad daylight are not too easy to read.

Obtain the largest size, flat wick kerosene burner made, and get the tin-man to make a square reservoir for it three and a half inches square and two inches deep and provided with a screwed topped feed hole.

Construct a bridge to carry this lamp with 20 inches clear between its uprights, so as to leave a clear space beneath, through which the spot may travel without obstruction. The exact height of this bridge cannot be given, as conditions will vary with every galvanometer, but it should be such that the bottom surface of the plank carrying the lamp should be at least as high as the top of the frame of the scale.

It will be best to provide means for raising and lowering the lamp somewhat similar to those described for the scale, but must be correspondingly stronger, as it will have to carry a heavier weight. Any temporary means of propping up the lamp on its board may be used to ascertain the approximate height required. Build a block tin lantern to receive the lamp, leaving space enough around the chimney to prevent too much heating. The lantern to be provided with a door at the back for placing and withdrawing the lamp, and the bottom of the lantern to be fitted with guides so that when the lamp is put in it will be at once in place, the edge of the wick pointing towards the mirror, and holes being perforated around its base so as to admit free access of air. It is of importance that the wick be in a straight line with the center of the mirror, or the spot will not be sharp and clear. The front of the lamp should have a slot cut therein half an inch longer than the flame, vertically and half an inch wide, and level with it, and a couple of grooves provided in which slide two shutters.

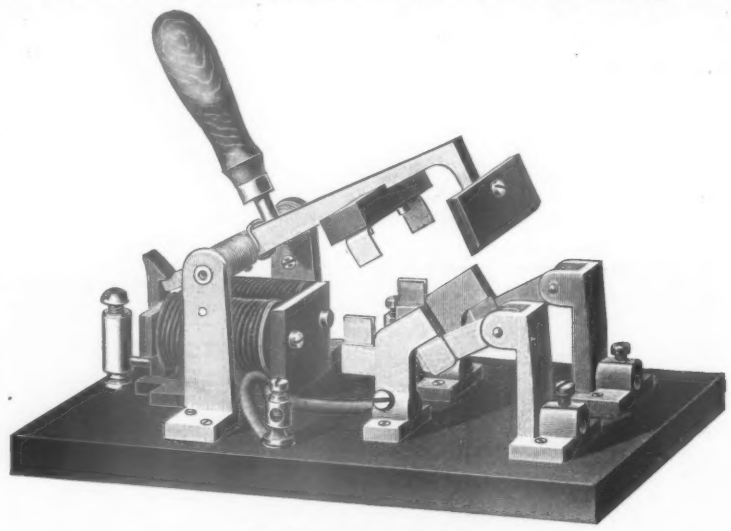
It is just as easy to fit two shutters as one, in fact, one big one cut in two is best, and, having two shutters, allows you to bring the slot exactly in the right place, viz., in the center of the flame's edge. They should slide with sufficient friction only to hold them in place and when directly in line with the flame and mirror, which may be easily ascertained by looking through them at the light within, may be closed with a tap of a penknife or opened with a twist of the blade's point with an accuracy sufficient for all practical purposes. Care, however, should be taken to have the edges of the shutters as parallel as possible and the shutters themselves should be of brass or zinc, one-eighth of an inch thick, bevel-edged to about $\frac{1}{8}$ on the slit side, the bevel being outwards.

The inside of the tin should be left bright and the outside japanned a dead black. A lamp like this will burn for two or three days without any attention and give a clear bright spot, and it is not necessary, as would be the case with a smaller lamp, to turn it up to its full power. None but the best oil should be used, and the chimneys and brass work kept scrupulously clean. A neat and very efficient temporary substitute for the lantern may be made by coating the lamp glass with the black used by plumbers for wiping joints. Apply a good coating or two and scrape a slit on it with a sharp penknife. But if a lamp breaks the whole process has to be renewed, besides which it is not always an easy matter to bring the slit exactly in place, especially when the lamp is lit and hot. This is not an unimportant matter, for on the nice adjustment of the slit will depend the clearness of your spot. Besides the black is apt to rub or crack off. Altogether, there are objections which render this kind of lamp nothing but a first-class and very convenient makeshift.

If you have incandescent lamps at hand you will find one far superior to any oil lamp. The lamp should be fixed bulb end pointing to the mirror, and care should be taken to choose one with a very straight parallel filament. This will give a sharp clear rod of light for a spot. Or a lamp whose filaments are twisted across each other will, by a little manœuvring of the lens, afford two cross rods or pencils of light, and your scale may be moved up or down so as to get the point of intersection of the two rods just above or below the scale you are reading from.

Half of the X being hidden by the scale used, the spot will be V-shaped. This gives a very sharp, clear index, which is delightfully easy to read from.

An arc lamp, whose rays are screened from the scale and lens, may also be made to provide a splendid spot if properly placed. But if you are working with a high constant, the fluctuations of the current will influence your spot if the lamp is too close to the galvanometer. Either arc or incandescent is very preferable to any oil lamp.



HILL'S SELF-ACTING SWITCH.

Electric Cars for Yonkers.

The common council of Yonkers, N. Y., last week granted the petition of the Yonkers Railroad Company to change its motive power from horses to electricity. It is hedged with so many restrictions that the permission may be declined. It is rumored that the Eickemeyer-Field system will be used.

The Burton Electric Company.

At a meeting of the board of directors of the Burton Electric Company, held December 15, at Richmond, Va., the following resolution, offered by Major Charles R. Skinker, was unanimously adopted: Be it

Resolved, That after hearing the favorable report of the superintendent, Dr. W. Leigh Burton, as regards the status of its business, we, the directors of said company, hereby desire to express our entire appreciation and satisfaction to Mr. W. R. Mason, president of the company, for the zeal manifested by him in the management of its affairs, and for his untiring efforts for the advancement of its interests, and to say further that we are well satisfied with the success of the enterprise up to this date.

Mr. Mason should, and doubtless does, feel highly complimented.

Hill's Self-Acting Switch.

The switch shown in the accompanying illustration was designed by Mr. W. S. Hill, to be used when charging storage batteries from arc lighting circuits, to prevent the circuit from being opened and the streets being left in darkness should any accident happen to the batteries, or any of the battery connections, by which the current would be broken.

The switch has four contacts, an electromagnet and a lever actuated by a spring when the lever is raised, as shown in the cut; the magnet, the four contacts and the batteries to be charged are all connected in series between the two binding posts. The latch that holds the lever up is held by the pull of the magnet on an armature. Should anything occur to open the circuit for an instant, the magnet will be discharged, and the latch be drawn back by a spring, releasing the lever which will drop and close the circuit between the two main line contacts and restoring the circuit. At the same time the connection between the main and the battery contacts is broken, thereby disconnecting both ends of the battery circuit and preventing its being short circuited on itself.

With slight modification the same device is used to cut out the batteries when they have been sufficiently charged.

In this case the position of the magnet is reversed, and it is made to release the latch when a predetermined amount of current is passing through the magnet. The circuit through the magnet being connected to the terminals of the batteries and in shunt thereto.

These switches are manufactured by the W. S. Hill Electric Company, No. 54 Devonshire street, Boston, Mass., and are guaranteed to do all that is claimed for them in a satisfactory manner.

The franchise of the Anniston City, Ala., Street Railway has been transferred to the Anniston Electric Street Car Company.

The Greenwich, N. Y., Electric Light and Power Company are putting in a 30-inch horizontal turbine built by the Swain Turbine and Manufacturing Company, of Lowell, Mass.

The Waddell-Entz Motor.

We illustrate herewith the three horse-power motor of the Waddell-Entz Electric Company, of Bridgeport, Conn. The motor is of the Gramme ring type with internal poles, and runs at 1,100 revolutions per minute. The variation in speed between no load and full load is less than two per cent. As this is a plain shunt machine, this is accomplished without any series differential winding on the field, which has the drawback of reversing the field when starting the motor across a line, and causing the machine to run first backward and then forward, but by a proper proportioning of the field and armature reactions, so that the weakening effect of the armature on the poles is just sufficient to compensate for the loss in speed that would result from a drop in the armature and other causes.

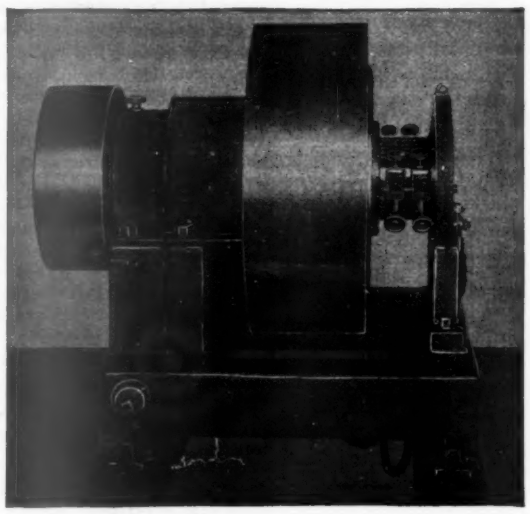


FIG. 1.—THE WADDELL-ENTZ ELECTRIC MOTOR.

There is absolutely no sparking at the brushes for any variation in load, and very little heat of the armature and magnet coils when running at its full load.

The armature is entirely enclosed in a brass case as shown, no wires being visible on the armature. The case serves to protect the armature from injury, and makes a very beautiful finish to the machine. It is impossible to tell by looking at the motor at what speed it is running, and almost that it is running at all, as it is perfectly balanced, and the smooth true surface of the armature case gives no indication of any motion.

The magnetic circuit of the machine is composed of two castings of cast steel or malleable iron with a bushing through the center of the magnet core for the shaft bearing, thus giving one long bearing with the armature overhung at one end and the pulley at the other.

The machine work on the magnet is extremely simple, being all boring and turning on one center, necessitating only one setting and centering in the mill. There is no planing work on the machine, excepting the rails.

The magnet coil is wound separately on an iron spool and is slipped on the core of the magnet which is cast to the right diameter and requires no turning off.

The form of the magnetic circuit cannot be readily seen from the cut, but is that of a single core wound with the magnet coil and pole pieces brought from each end of the core around the head and top of the coil and presented to the inside armature surface. This gives an as short as possible magnetic circuit and is economical both as regards weight of metal and the exciting power required for the same.

The machines are self-oiling and have an oil reservoir and chain at each end of the shaft. The oil wells communicate with each other by a hole at the bottom of the core and are filled from the back end of the machine, where the drain-pipe is also situated. These oil wells and holes are all cored out in the casting and represent no machine work. The bed-plate is a casting of ordinary gray iron and has a saddle at the back end bored out to fit the magnet which is bolted to it as shown. The seat for the brush-holder frame is bored out at the same centering.

The weight of the machine complete is 316 pounds, and the over-all dimensions are: Height, 18 inches; length with pulley, 18⅝ inches; width over rails, 19 inches. The machine being practically a cube in its dimensions thus occupies the smallest possible space for a given weight of material. The commercial efficiency of this machine is stated by the makers to be 86 per cent. of full load.

Larger machines of this type are of the multipolar type, but with a single core and exciting coil as in the present size. This construction makes it possible to build as efficient a multipolar machine as a bi-polar, which is not possible with a multiple core and coil type. The long single bearing that is shown in this present size is not used alone in the larger sizes, the larger sizes having two bearings as usual.

Suit for Damages to Poles and Wires.

The East River Electric Light Company, of New York, filed with Comptroller Myers on December 23, a claim for $50,000 damages to its property and business, caused by the cutting down of its poles and wires in December, 1889, under the order of Mayor Grant.

The company claims that this damage was unauthorized by law; also that many wires and poles, legally erected, and in streets where there were no subways, were cut down, although the wires were perfectly safe and properly insulated, and that the investment of the company was thus rendered worthless, and its overhead franchise practically destroyed.

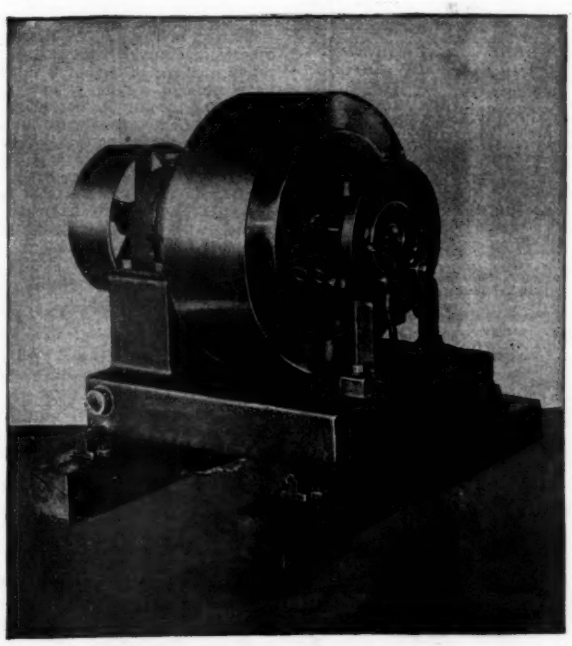


FIG. 2.—THE WADDELL-ENTZ ELECTRIC MOTOR.

A Western Quill on Dangers of Electricity.

A STRONG ARGUMENT FOR BETTER SCHOOLS.

About 5:30 this morning flames were licking up over the partition and under the ceiling of the operating room of the Postal Telegraph office. The fire was soon located in the battery room, by Gus. Costel, the night clerk. Throwing the door open leading into the battery room, he found the switchboard on fire. Nothing daunted, and with perfect coolness, he stepped inside where hundreds of batteries are placed on shelves, and a perfect network of wires threads and mats the room, he took his life into his hands by seizing the nearest battery and emptying its fluid contents on the climbing flames. This partially checked the fire. When the department arrived with a Babcock, the fire was extinguished after a severe loss.

The origin of the fire is assigned to spontaneous combustion. It could not of itself be ignited in any other way. Had it not been for the timely and dangerous act of the night clerk, the whole office in five minutes more would have been in ashes. An operator in explaining how the night clerk escaped so well, said: "His shoes were dry and accidentally he caught hold of the battery just where it was safe to handle it and he was not in the room long enough for the soles of his shoes to become soaked. That is why he avoided a shock that might have killed him instantly."—*Portland Dispatch.*

The Remington Typewriter.

Wyckoff, Seamans & Benedict, New York, have sent out a very handsome new calendar. It is a steel engraving of the Remington typewriter surrounded by a wreath of roses. The calendar is one of the handsomest we have ever seen. We understand that this enterprising company has spent $12,000 in calendars this year.

Jamestown, N. Y., Street Railway Company.

A notable addition will be made to the plant of the Jamestown Street Railway Company, Jamestown, N. Y., and the John T. Noye Manufacturing Company, of Buffalo, N. Y., have secured the contract. There will be added two of the Noye Company's "B" style, heavy duty, compound, condensing engines of about 400 horse-power each, to operate two Short generators having a capacity of 250 horse-power each. It is expected that the enlarged plant will be in operation at the opening of the excursion season next Spring. Provision has been made in the plant for another engine like the foregoing, which may be added later on. The present plant consists of three Dick & Church engines of 125 horse-power each.

Malden, Mass.—Massachusetts Wire Company; capital, $25,000.

Newark, N. J.—The Newark Chandelier Works; capital, $25,000.

Mio, Mich.—Little Northern Telegraph Company; capital, $1,500.

Albuquerque, N. M.—Electric Reduction Company; capital, $20,000.

Jersey City, N. J.—New York Electric Railway Company; capital, $25,000.

Hornellsville, N. Y.—The Hornellsville Electric Railway Company; capital, $50,000.

Newville, Pa.—Newville Electric Light, Heat and Power Company; capital, $5,000.

Jonesboro, Ind.—The Jonesboro and Marion Electric Street Railroad Company; capital, $10,000.

Adrain, Mich.—The Gilliland Electric Company has increased its capital stock from $50,000 to $100,000.

Princeton, Ill.—The Princeton Electric Light and Power Company has certified to an increase of capital stock from $15,000 to $20,000.

Murphysboro, Ind.—The Murphysboro Street Railway Company has decreased its capital stock from $25,000 to $11,000, and increased the number of directors from five to seven.

Reading, Pa.—Neversink Light, Heat and Power Company; capital, $50,000. Promoters, Geo. Brooke, R. T. Leaf and Henry T. Kendall. Incorporation papers sent to Geo. F. Bear, Reading Pa.

Colchester, Ill.—Colchester Electric Light and Power Company; capital, $6,000. Promoters, S. D. Mills, John E. Hall and M. P. Agnew. Incorporation papers sent to S. D. Mills, Colchester, Ill.

Fairbury, Neb.—Fairbury Electric Light and Power Company; capital, $30,000. Promoters, H. E. Chubbuck, Fred. W. Allen, Frank Dungan, Samuel W. Schweitza and R. B. Howell, all of Fairbury, Neb.

Boonville, Ind.—The Boonville Electric Light and Power Company; capital, $10,000. Promoters, L. J. Miller, S. B. Hatfield and C. M. Hammond. Incorporation papers sent to Hatfield & Hemenway, Boonville, Ind.

Everett, Wash.—Everett Light and Power Company; capital, $50,000. Promoters, Henry Hewitt, Jr., and F. H. Brownell, of Tacoma, Wash. Incorporation papers sent to Brownell & Brownell, Tacoma, Wash.

Noblesville, Ind.—The Noblesville Light and Ice Company; capital, $25,000. Promoters, J. L. Peck, S. J. Peck and Geo. Christian, all of Noblesville. Incorporation papers sent to J. L. Peck, Noblesville, Ind.

Waseca, Minn.—Waseca Light and Power Company; capital, $50,000. Promoters, L. P. Ordway, F. L. Benjamin and Frank Benjamin, of St. Paul, Minn. Incorporation papers sent to F. L. Benjamin, 76 Winefred street, St. Paul, Minn.

Akron, O.—The Akron Electric Light, Heat and Power Company; capital, $300,000. Promoters, Ira M. Miller, H. H. Crowther, A. S. Hauscom, R. P. Burnett and C. H. Loomis. Incorporation papers sent to Baird & Voris, Akron, Ohio.

White Bear, Minn.—White Bear Electric Company; capital, $10,000. Promoters, H. M. Byllesby, G. C. Duffie, W. P. Johnson, B. F. Meek, Jr., and H. C. Levis, all of St. Paul, Minn. Incorporation papers sent to H. C. Levis, 403 Sibley street, St. Paul, Minn.

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NEW YORK, JAN. 2, 1892.

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HAPPY NEW YEAR!

The alternating current motor will be one of the live features of electrical work this year. And soon, too. Put us down for a prophet.

During the recent holiday rush both shopkeepers and purchasers appreciated the advantages of the telephone in doing the season's shopping. Many a heartache was saved the little ones by a happy thought and the use of the telephone.

The benefit of the electric light in the factories of Germany is said to have been so marked that it is proposed to make its use compulsory in all works where artificial light is employed during working hours. The incandescent lamp is rapidly coming into universal use in the factories of this country.

The ELECTRICAL REVIEW is to-day in receipt of a greater number of new subscribers and of widely-distributed requests for specimen copies than at any time in its history, every week showing an increase over the preceding one. Therefore, we enter the new year with unfeigned gladness and satisfaction. Nothing so delights the editor, no matter what or where his field, as the fact that his journal is constantly acquiring more readers; nothing so convincing of the influence and value of his earnest work, for every true editor is very much in earnest.

We do not find it necessary to send out circulars to our advertising patrons to convince them that the REVIEW is widely read and approved by the best class of readers; they are satisfied with results and remain with us. Besides, if the circular method of reaching the public became universal there would be no patrons of the advertising columns of the REVIEW or of the columns of its esteemed contemporaries. In this relation, the circular mania, like the conscience-destroying efforts of the circulation claimant, always appears to us, as it does to many others, as a confession of weakness.

With sincere best wishes for every one—for subscriber, advertiser, esteemed contemporary—and with the hope that all may enjoy a prosperous and happy new year, the REVIEW looks to the future with bright hopes and numerous ambitions, proud of the science of which it is an humble exponent, and proud of the many brilliant, practical and onward-moving minds the great world of electrical endeavor has attracted within her borders.

We chronicle with considerable satisfaction the fact that Brooklyn has been allowed to adopt the trolley system. The electric car, in its onward march of progress, cannot be halted. It has come to stay.

The following editorial paragraph from the New York *Evening Sun* evidences woeful ignorance or a willful contortion of facts:

Viewed in the light of the experience of other comparatively large cities in the United States, the city of Brooklyn must be said to have taken a distinctly retrograde step in permitting the introduction of the trolley system of propeling street cars. Whatever advantages of cheapness this system may have for poor towns, sparsely populated, it is inconvenient and cumbersome in a densely populated city. The desirable end in a perfect street car motor is that it should be automatic, without any outside connections, noiseless, quickly stopped and started, and commercially practicable.

We beg to refer the *Evening Sun* to the splendid electric railway systems of the West End Company at Boston and the interurban lines between Minneapolis and St. Paul. These are but two of many examples, but they will suffice.

The adoption of the trolley system in Brooklyn means that the street railway companies of that city will spend the tidy sum of $8,500,000 in its installation. Looked at from an economic standpoint, this should balance many of the so-called disadvantages which the daily press claims to see in the trolley system.

We congratulate Speaker Crisp upon his selection of the Hon. A. C. Durborow, Jr., as chairman of the House Committee on the Columbian Exposition. The electrical field is especially fortunate in being represented in such an important place by a gentleman thoroughly familiar with electrical progress and development. Mr. Durborow is a graduate of electrical journalism and we feel sure that the interests of our field will be well watched by him.

Brooklyn has been known for some time as one of the best lighted cities in the country. To the Hon. Thomas F. Nevins and Mr. E. F. Peck, of the Citizens' Illuminating Company, much of the credit for this state of affairs is due. Now that Brooklyn has achieved the trolley, we may look to see it become one of the first among electrically equipped municipalities.

CAN RAILWAY COLLISIONS BE PREVENTED?

TO THE EDITOR OF ELECTRICAL REVIEW:

The long list of railway collisions which have taken place recently in many parts of the country, has aroused a great deal of indignation against the management of the systems which suffered the misfortune. Concerning the smash of last week, at Hastings, the superintendent is quoted in the Sunday *World* with the remark: "Just as long as railroads are conducted there will be accidents on them. Only the risk of disaster can be minimized." In the main he is right in the assertion; but it seems to me that no system of block *signals* will ever bring that risk to a minimum such as all travelers look for. Even the so-called "absolute" block signal system will have its errors and misunderstandings, for *humanum est errare.* I am no railroad man in any sense, but I have traveled enough thousands of miles to know a little about railway matters. I know that stronger than the combined strength and clamor of all the daily journals and their readers, is the strength of the wish of every railway manager that he could lay his head down every night with the certainty that his trains would go through unscathed. But none knows better than he that "in the midst of life we are in death." To such a man, the possession of a sympathetic heart is worse than the torments of the *inferno.*

The block signal system is a good thing in all its various forms, but it does not escape from dependence upon human intelligence, brains must be its fountain-head and brains and fidelity to duty must extend throughout every detail of practice. Human error cannot be eradicated, and both head and rear collisions are possible and do occur and will recur, but with diminishing risk as the block signal system is improved. The system is an old one, and never amounted to much till our universal benefactor, electricity, was brought in play. But even now the wires can pulsate as well with a misconstrued or carelessly disastrous instruction as they can throb with the truth. Signals can be displayed and fog, rain, snow or defective vision will hurl a train to destruction. Trains must and will be operated on the permissive system, or long and unendurable delays will ensue at times, and the careful management causing such delays will receive the unending maledictions of the very travelers whose lives would perhaps be saved by the delay. Signals will be mistaken in spite of everything. Such was the cause of the harrowing wreck caused by a rear-end collision a year ago at New Florence. I was on the train which received the tremendous shock, but not in the telescoped sleeper. This collision revived some thoughts which previous wrecks in which I had participated had taken deep root in my mind. I believe that with a proper outfit all collisions of trains on the same track *can be absolutely prevented,* whether from the front or rear. This seems, perhaps, strong language, but I think any practical electrician will confirm it after getting the idea. It is not patented, and if lives could be saved, I shall be happy to see it adopted as a practical adjunct to the block signal system for the control of fast passenger trains on our railways.

Its simplest application would be in protecting a train which stops for repairs or other cause out on the line. Imagine every passenger locomotive fitted with a powerful but inexpensive electromagnet adapted, on passage of current, *to close the throttle valve,* and another smaller magnet which, at the same instant, would operate a special valve in the brake pipe and set the system for an emergency stop. Is it not plain if a train so equipped were thundering along at a mile a minute and the energizing current were sent through these magnets, steam would be instantly shut off, and the air brakes applied all over the train and all brought to a standstill? Yes, even if the engineer were holding the throttle lever, or were asleep, or had become disabled. And, further, if the energizing current were projected from the train already standing on the track ahead, how could a collision occur? It strikes me

it would be impossible. The sending of current from the stationary train would be very simple, and the devices should not cost more than a couple of hundred dollars for each engine. Every locomotive would be fitted with a very small steam engine, driving a very small dynamo, and the two magnets already mentioned. The throttle of the little engine could be boxed against access, and arranged in connection with the main throttle, so that when the engineer of a train shuts off steam to stop his train the small throttle is by that very act opened, and the little engine and dynamo start up without the exercise of any human intelligence or memory whatever. A most inexpensive circuit would be a small oak stringer laid along and spiked to the cross ties about the center and surmounted by a small flat copper strip laid in continuous lengths of, say, one-half mile, each length being separated entirely from that in front by a gap of, say, one foot. The other side of the circuit would consist of one or both rails. Each locomotive circuit would terminate at one end in the wheels, as in an electric street railway system, and at the other end in a brush or trolley riding on the copper strip, but insulated from the metal running gear of the locomotive. The little dynamo would be shunt or compound wound. The half-mile lengths of copper strip would constitute the "blocks."

The result of such a system would be that the moment an engineer shuts off steam preparatory to a stop anywhere on the railway, his dynamo would instantly start into action and become fully excited by the time the train stopped. Then the instant a coming train reached the end of that block, its magnet and dynamo circuit would complete the circuit for the dynamo on the stationary train, and the approaching train would be automatically stopped at a safe distance. Every train would thus constitute its own safety system as a last resort, and even if the engineer of the second train failed to see a danger signal, or misunderstood it, or the towerman displayed a wrong signal (and these things will happen) the approaching train would be stopped in spite of its own crew. Many modifications and ramifications are possible to meet every objection I have been able to advance or learn from others. A 100 volt dynamo of two ampere capacity would suffice for all conditions of weather, and a one-third horse-power engine would drive it. Both could be put in a box on or under the footboard, similarly to the air pump, and not be in the way.

If you desire, I will submit sketches of the system, as not being one of the army of patentees who worry the life out of railway superintendents, I have no axe to grind.

New York, Dec. 28, 1891. T. J. McT.

[The above is from an able, practical electrical engineer, and his suggestions are worthy the fullest consideration by railroad men. We shall be pleased to illustrate his ideas in a later issue.—ED. REVIEW.]

The "Jewel" Trade-Mark.

TO THE EDITOR OF ELECTRICAL REVIEW:

In looking over the list of new incorporations in a recent issue of the Chicago *Evening Post*, I noticed that certain parties, wholly unauthorized by me, have made application to the secretary of State for the incorporation of a company for the manufacture of incandescent lamps. This company to be known as the "Jewel Incandescent Lamp Company."

The purpose of these parties, whoever they may be, is evidently to appropriate the name "Jewel" as applied to incandescent electric lamps, and for the purpose of defrauding me of my trade-mark, which I have extensively advertised and introduced, and which name has become very valuable.

The name or trade-mark "Jewel," as applied to incandescent lamps, originated with me and is my personal property. Any attempts by other parties to pirate this name is not only an injustice to me, but to users of the "Jewel" incandescent lamp.

By kindly giving this publication in your valuable paper, you will greatly oblige

Yours very truly,

Chicago, December 24. WM. HOOD.

CORRESPONDENCE.

OUR BOSTON LETTER.

The Electric Heat-Alarm Company has taken possession of a commodious suite of offices at No. 113 Devonshire street, this city.

Mr. Louis J. Magee, manager of the Thomson-Houston (German) International Electric Company, will sail for Europe Saturday, December 26.

The National Telephone Manufacturing Company, of this city has issued a new circular, illustrated, giving particulars regarding the Bennett telephone system.

The New England Electric Club was organized on the evening of December 23, by a number of electrical people who assembled at the Tremont House, this city.

Mr. J. Draper Bishop, electrical engineer and connected with the J. A. Roebling's Sons Company, Trenton, N. J., was one of the prominent electrical arrivals in town this week.

Mr. E. I. Garfield, secretary of the Thomson-Houston Electric Company, recently returned from an extensive business tour through the West. Mr. Garfield's numerous friends will now be grieved to learn of his serious illness, which he contracted *en route* for home.

Mr. C. J. Goodwin was recently appointed treasurer of the Chapman Valve Manufacturing Company, of Indian Orchard, Mass., with office at the company's headquarters in the Mason building, this city. This company has been awarded patents on an important invention known as the Straightway valve for heavy pressure steam.

The Mutual District Telegraph and Messenger Company, of this city, has been absorbed by the American District Telegraph Company, also of Boston, and a new board of directors elected. The new board consists of: President, E. H. Chapman; vice-president, H. L. Hotchkiss; secretary, W. M. Rider; treasurer, A. Blackbourne.

The Post Engineering Company is the name of the new enterprise recently organized to succeed the old and reliable Boston firm of John Post, Jr. & Company. The company will engage in engineering and contracting for the erecting and equipping of electric lighting and power stations, and will be New England agents for the Standard, Ide and Ideal engines. Mr. John Post, Jr., is president and Mr. A. R. Brown, treasurer.

Mr. Louis J. Magee, manager of the newly organized Thomson-Houston German Electric Company, at Berlin, Germany, was tendered a complimentary banquet on the evening of Thursday, December 17, at Young's Hotel, this city, by General Manager E. W. Rice and other officials of the Thomson-Houston Electric Company. Mr. Ernst Thurnauer, general agent for France of the company named, was among the distinguished gentlemen present at the banquet.

Boston, Dec. 26, 1891. W. I. B.

OUR CHICAGO LETTER.

The Thomson-Houston Electric Company, Chicago, are out with a picture of the Masonic Temple building, which they are sending to their patrons. By placing an incandescent light behind the picture it shows this beautiful structure as it will appear when fully lighted. It is nicely gotten up and sure to attract attention.

W. L. Popple & Company, electrical engineers, 407 The Rookery, have just put a $3,000 electric light plant in the new St. Cecilia's church on 45th street. The lights are placed around the octagonal roof, and by means of a key-board can be lighted by sections as desired. This church is modeled after the Notre Dame, in Paris, and is one of the handsomest and most complete churches in Chicago.

At the Meeting of the Chicago Electrical Association, December 22, Mr. A. H. Adams, presented a paper upon "Chimneys and Chimney Draughts," after which Mr. L. G. Bassett read a paper entitled "The Speed of Electricity." The following officers were elected to serve six months from January 12, 1892: President, E. G. Hovey; vice-president, J. F. Conner; secretary, F. R. Mc Berty; treasurer, Albert Scheible. This Association meets on the second and fourth Tuesday evenings of each month at 169 Washington street.

The Chicago Electric Club at their regular meeting on Monday evening, December 21, were favored with a paper entitled, "Rapid Transit for Great Cities," which was presented by St. John V. Day. Mr. Day criticised cable systems everywhere. Spoke in more respectful terms of elevated roads, but pronounced the electric road as the coming means of transit in cities. The next paper will be presented by J. P. Barrett, chief of the department of electricity, January 4, entitled, "Electrical Exhibitions During the World's Columbian Exposition."

The Central Electric Company's city trade has become of such importance and consideration, that they have been obliged to put on a special delivery wagon. In doing so, they have selected a wagon of original design and artistic appearance, which excites comment wherever it goes. This company reports a splendid business in their improved Candee weatherproof wire, and special Candee feed wire for electric railways. These wires are the product of the Okonite Company, and are up to the high grade of this well-known company's products.

Electric Light Companies at War.—A bill was filed in the circuit court this week by the Great Western Electric Supply Company to compel the Chicago Sectional Electric Underground Company to execute to complainant a lease for placing two wires in its conduits and electrical conductors so as to connect dynamos at 83 Madison street with the lights in the territory south of and adjoining Madison, Dearborn, Monroe and State streets. It is alleged that the Chicago Arc Light and Power Company and the defendant are owned and controlled by substantially the same persons and are really one corporation; that the Arc Company has a large number of wires in the conduits of the defendant, and that the refusal of the latter to execute a lease to complainant is a conspiracy between the two concerns to keep out other companies, and especially complainant. A motion will be made before Judge Collins for an injunction to restrain the Sectional company from preventing complainant using its conduit for two wires.

Chicago, Dec. 26. M. J. B.

New York Electrical Society.

The one hundred and forty-first meeting of the New York Electrical Society will be held in Dr. Chandler's room, School of Mines, Columbia College, on Wednesday, December 30, at 8 P. M.

Mr. A. A. Knudson will lecture on: "Frauds in the Electrical Business."

The lecture will deal with the various ways in which the general belief of the public in the ability of electricity to do everything is taken advantage of by cranks and sharpers. Mr. Knudson will relate some of his experiences in exposing such frauds, and will suggest remedies for the evil.

OBITUARY.

Mr. G. W. Coster, district agent for the Edison General Electric Company at Denver, Colo., died at Schenectady, N. Y., December 20. Mr. Coster was on his way to New York. He stopped over at Schenectady to visit the Edison shops and caught a severe cold which suddenly caused his death.

William H. Bauer, one of the oldest practical telegraphers in Baltimore, died December 14, at his home, aged 72. Mr. Bauer first entered the service of the Southern Telegraph Company about 1848 as manager, when there were only two wires leading south from Baltimore. He afterward was employed by the Magnetic Telegraph Company, which had two wires between Baltimore and New York. He entered the service of the Baltimore and Ohio Telegraph Company at Camden Station, in Baltimore, in 1858, and continued there and at Mt. Clare until 1879, when he retired from the business.

American Institute of Electrical Engineers.

The following resolution passed by the International Congress Committee and the council of the American Institute of Electrical Engineers, is the outcome of the recent visit to New York city of Dr. Elisha Gray, of Chicago, chairman of the committee on the World's Electrical Congress.

Dr. Gray, after several informal interviews with officers and members of the Institute, was invited to attend a meeting of the Congress committee on December 16, where a mutual exchange of views upon the subject was had, and, so far as is known, the result is entirely satisfactory to all parties interested.

Resolved, That the American Institute of Electrical Engineers, having already taken action during the past three years, by correspondence and otherwise, towards the holding of an International Electrical Congress in connection with the Columbian World's Fair, hereby expresses its desire and intention to co-operate, by all means in its power, with the World's Congress Auxiliary of the World's Columbian Exposition, through its Electrical Congress Committee, in furthering the gathering of such a congress at Chicago, in 1893, and in making it a successful and worthy representation of the best electrical science and practice in all parts of the world.

PERSONAL.

Mr. H. A. Royce, of the Thomson Electric Welding Company, Boston, visited New York last week.

Messrs. Magee and Thurnauer, of the European agencies of the Thomson-Houston Company, sailed for Paris and Hamburg on December 26.

Charles Steinmetz, of Yonkers, N. Y., is well known in the electrical field. He is a graduate of Heidelberg University and is a member of the American Institute of Electrical Engineers and the New York Mathematical Society.

A private dinner was given at Young's Hotel, Boston, one evening last week, by Mr. E. W. Rice, Jr., general superintendent of the Thomson-Houston Company, to Mr. L. J. Magee, general manager at Berlin of the newly organized German Thomson-Houston Company, and Mr. Ernst Thurnauer, general agent for the company for France.

Mr. S. B. Dod has been elected president of the North Hudson County Railway Company to succeed the late John H. Bonn. Mr. Dod holds many places of trust, among them the presidency of the Stevens Institute board of trustees, membership in the Princeton College board of trustees and presidency of the Hoboken First National Bank. Under his administration electricity is to be introduced as a motive power.

Mr. B. P. Van Court, for some years past well known in the iron and steel business in Detroit, has recently been appointed general manager of the Detroit Motor Company. Mr. Van Court is a thoroughly wide-awake and progressive business man, affable and courteous in manner, and one who will make many friends in his new field of work.

Capt. Willard Lyman Candee, manager of the International Okonite Company, Limited, sailed for London on the "Etruria" Saturday of last week, accompanied by his son William. In a recent issue of Brooklyn *Life* appears a portrait of this well known electrical gentleman with the following allusion to the Captain's linguistic proficiency:

"The business of his company has taken him to Europe on several occasions, and he has scores of acquaintances in the great capitals of London, Paris and Berlin, his proficiency in speaking foreign languages greatly aiding him in commercial matters as well as in enjoying the society of the French and German people."

Calendars and Other Remembrances.

The REVIEW has been remembered by many of its friends with calendars for 1892. One of the first and also one of the most unique is a card calendar sent us by the Standard Paint Company, of No. 2 Liberty street, New York. The trade-mark and a neat advertisement of the widely known insulating compounds of this company, as well as the calendar, are printed in letters and figures of gold.

H. T. Paiste, the Philadelphia manufacturer of electrical specialties, wishes us a "Merry Christmas and Happy New Year," accompanying these greetings with a beautiful calendar that is a welcome addition to the office of nearsighted editors.

Philip Metz, the New York dealer in old metal, sends a calendar on which appear an attractive marine view, flowers in colors and a pair of sweethearts.

An annual pass over the Bristol (Tenn.) Belt Line Railway reached us through the kindness of Mr. W. A. Stadelman, the general manager. We hope to use it often.

Cigars, bountiful and of fine flavor, come to us from a gentleman who never wishes his name known (Col. Chas. Dutton, of the Telephone building), and who gladdens many of his friends every Christmas by these considerate attentions.

Morris Mead, the progressive superintendent of the Bureau of Electricity, Pittsburgh, sent in the best known in that city—that which has made his city famous—but what it is, of course, we must not tell. It is for medicinal use only!

Major Moses P. Handy, of the World's Columbian Exposition, and Dr. J. Allen Hornsby, secretary of the Electrical Department, kindly remember the REVIEW with a beautiful painting of the Exposition grounds that is worthy of the place of honor on the office walls.

Geo. Cutter, of Chicago, sends a kindly greeting and a picture of several cupids wondering why an arc lamp doesn't drop after the wire is broken. Cutter's lamp holder explains this.

Telephonic News

*** The Erie, Pa., telephone exchange is now connected by long distance wires with Pittsburgh, Johnstown, Altoona and other cities in the southern part of the State.

*** The November rentals of the Mexican Telephone Company were $6,070, an increase of $550 over 1890. The telephone instruments in use have increased from 1,098 to 1,203 in a year.

*** W. A. Mowrer, local manager of the Bell Telephone Company, at Kalamazoo, Mich., has left the city in a mysterious manner and an investigation of his accounts shows a shortage of a sum which rumor places at $2,500, though the authorities refuse to confirm the figures.

*** A clever bit of telephone work was done at Tewkesbury, England, on the occasion of the opening of the public call room. The representative of a Tewkesbury paper had to transmit over the telephone to Cheltenham a report of some 700 words. The time allowed to users of the telephone for communication between towns at the call room is three minutes, and in that time the whole of the report was spoken over the wire and received. Any one who has ever tried to speak extempore at the rate of even 200 words a minute will have a good idea of the cleverness of speaking and receiving more than 230 words a minute over the telephone.

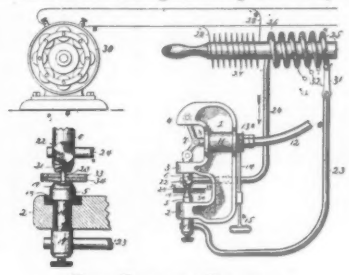
*** The Paris *Electricité* says that October 26 last was the 30th anniversary of the day that Phillippe Reis, a schoolmaster at Fredericksdorf, a little market town of Hesse-Electoral, presented his telephone to the Physical Society of Frankfort-on-the-Main. The notice of such a discovery appeared not to call any attention to the invention or its author. A singular fact may be cited to show with what difficulty new inventions are propagated. The communication of Reis was a studied effort comprising more than ten pages of the report of the society, yet the fact of the discovery or its author's name were not mentioned in the catalogue published by the Royal Society of London, which registered more than 100,000 scientific articles. Though all the scientific literature of the world have been put to a contribution by the authors of this gigantic compilation, all that concerns the first experiments regarding the telephone has escaped.

*** Tenders for the Nova Scotia Telephone Company's new building at Halifax, N. S., have been opened and the contract awarded to Rhodes, Curry & Company, of Amherst, N. S. The building is to be erected on the northwest corner of the property on the corner of Hollis and Salter streets purchased by the telephone company, and will face the south end of Granville street. J. C. Dumaresq was the architect, and the building will be of brick with freestone trimmings, two storys with basement. It will have a flat roof with fireproof covering and will front 30 feet on Salter street with 70 feet depth. The basement will be used for stores and work-rooms for the men. On the first floor will be directors' and manager's rooms, the clerks' offices and a repair room. On this floor will also be the long distance telephoning room, distributing and cloak and lunch rooms for the operators, as well as a repair room. The whole of the third floor will be occupied as an operating room, in which the multiple switchboard will be placed. The building is to be finished by June 25, 1892, but will not likely be occupied until October, as it will take several months for the removal of wires, etc. The estimated expenditure in new building improvements, etc., is about $25,000.

PROGRESSIVE ELECTRICAL INVENTIONS.

RIVETING BY ELECTRICITY.

The principle of bringing a piece of metal to incandescence by passing a heavy current of electricity through it finds a very useful application at the hands of Elias E. Ries, of Baltimore, Md., in riveting two or more pieces of metal together. The apparatus as illustrated in a patent recently issued with very broad claims, is shown in the accompanying engraving, and will be almost self-explanatory. The rivet is inserted in a hole formed in the two pieces of metal to be riveted and a heavy current of electricity as from a transformer is passed through the rivet, which brings it up to a temperature where it may be readily headed. The transformer is illustrated at 25 to 28 in the engraving, and the volume of the current may be regulated by the switch 31. A heading die 6, controlled by a toggle joint 7 and cylinder 11, is so arranged that when the lever 15 is turned, compressed air or steam may be admitted to the cylinder 11, the joint 7 straightened and the heading die brought down upon

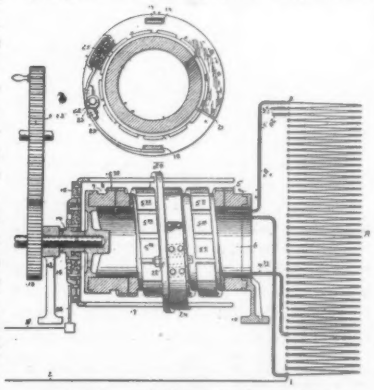


RIES ELECTRIC RIVETER.

the top of the rivet. The anvil 17 is insulated from the frame 1, so that the current will be forced to travel through the rivet. This arrangement is illustrated in detail in the detached view.

MOTOR RHEOSTAT.

It is desirable to have rheostats designed to be used in motor work occupy as little space as possible. In cases where a rotary switch arm, traveling over a circular row of contacts, is used, the arm must be given a considerable radius in order to provide a sufficient area of contact at the several contact spots to prevent undue heating. With a view to rendering the device more compact, Messrs. Frank J. Sprague and C. R. Pratt, of New York, have designed the structure illustrated in the accompanying engravings. Upon a hollow cylinder of insulating material is cut a spiral groove, leaving a wide face to the projecting ridge between the several convolutions of the groove. Upon this projecting ridge are mounted a series of contact plates, as shown at 5^9, 5^{10}, 5^{11}, etc., in the engraving. In the groove is mounted a nut, 20, provided with projecting ears, through which rods, 17, parallel to the axis of the cylinder project in loose engagement. These rods are mounted upon an annular ring of insulating material, so as to insulate them from the shaft. The shaft is driven by a system of gearing operated by hand or

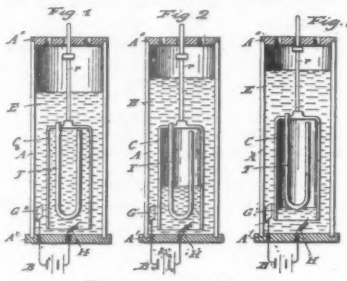


SPRAGUE & PRATT'S RHEOSTAT.

in any other desired way. When the handle is turned the rods, 17, are rotated about the cylinder and rotate with them the nut, 20, which, following the groove in the cylinder, brings a brush mounted at 22, and provided with a carbon shoe bearing upon the contact spots, into successive engagement with the several contact blocks, 5^9, 5^{10}, etc. The blocks are consecutively connected with different points of a resistance coil or other resistance medium, so that as the carbon shoe is translated over the series of contact spots, resistance will be cut in or out of the circuit, 2 2′, in which the device is interposed.

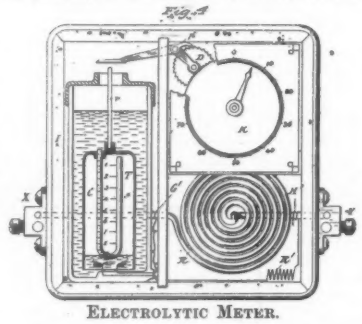
ELECTRIC METER.

An ingenious self-registering electrolytic meter has been designed by Mr. Addison G. Waterhouse, of Hartford, Conn., for which



ELECTROLYTIC METER.

a patent has been lately issued. The invention may be understood by an inspection of the accompanying engravings, in which Figs. 1, 2 and 3 show the electrolytic cell of the meter in different stages of action, and Fig. 4 illustrates a complete commercial apparatus. The operating portion of the apparatus comprises an inverted bell supported in the electrolyte and provided with a guide rod *r* projecting through the top of the cell. Within the bell is a U-shaped tube open at both ends having one leg projecting through the top of the bell and the other terminating near the top of the bell on the inside. The electrodes of the circuit are arranged as shown at G H, one being beneath the bell and the other on the outside of the bell. Under these conditions, when the current is passed through the electrodes the gas of decomposition rising from electrode H

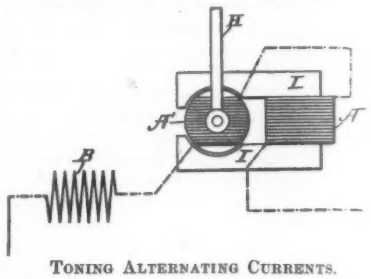


ELECTROLYTIC METER.

gradually displaces the liquid under the bell, as shown in Fig. 2. When sufficient gas has accumulated to displace enough liquid it has increased the buoyancy of the bell sufficiently to lift the same in the liquid until arrested by the stop on the rod *r*. This is arranged so as to occur when the electrolyte has been forced by the displacing gas to a point almost at the bottom of the U-shaped tube. Any further displacement of the electrolyte forces a few bubbles of gas to escape through the bent part of the tube, which then acts as a siphon and permits all the gas to escape, and the bell drops to the position shown in Fig. 1. These motions of the bell are periodical and depend upon the amount of current passing through the electrodes. The rise and fall of the bell is made to actuate a register by operating at each upward movement a ratchet wheel D, which communicates motion to a gear train and shifts the indicator shown in the drawing. The current led to the electrodes is preferably carried by a shunt R^1, around the resistance R in the main circuit, the resistance being adjusted so that a very small portion of the current, as, for example, one per cent. or less, will pass through the meter.

TONING ALTERNATING CURRENTS.

The use of self-inductive devices for reducing the flow of alternating current by their choking action is well understood. Another method of accomplishing the same result which permits of a wide range of variation in the degree of counter electric effort offered by the reaction device is illustrated in the accompanying engraving, and was designed by Prof. Elihu Thomson. The device comprises two coils A and A′, one of which is wound about the core I, the other of which is wound about a core similar to a Siemens I armature, and so arranged that it may be rotated in an annular space formed between the extremities of the core I, just enough space for clearance being allowed between the two. Both coils are included in the circuit. It is evident that if the handle H be rocked while the alternating current is flowing, that the lines of force set up in the rotary portion can be made to cooperate to a greater or less extent with those set up by the other coil, or can be made to oppose them. In the position shown in the drawing the coil being axially in the path of the lines of force will either largely increase or largely reduce the effect of the coil A, depending on the direction in which the coil A′ is wound. If the adjoining poles in the two cores are of unlike sign then the lines of force in the two systems will have a common path, and the device will oppose a maximum counter electromotive effort to the alternating current. If rocked away from this

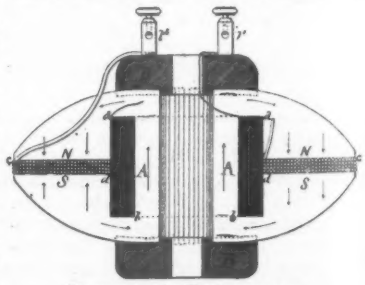


TONING ALTERNATING CURRENTS.

position this counter electromotive effort will gradually decline and more current will pass as the angular deviation from its present position increases. When shifted through an angle of 180 degrees the lines of force in the two systems will tend to neutralize each other, and a maximum amount of current will pass, the obstruction offered being such as might arise from leakage across the air space between the two coils and the two limbs of the core I.

ALTERNATING CURRENT TRANSFORMER.

An improved open circuit transformer has been recently patented by a Russian inventor, A. Poleschko, which is illustrated in the accompanying engraving. It comprises a series of radially arranged disks or plates of soft iron of a shape indicated in the engraving slotted vertically so as to form when assembled a hub about which the primary circuit may be wound, and provided also with a horizontal slot in which the secondary winding is laid. The lines of force flow across the space filled by the secondary conductors.



POLESCHKO'S TRANSFORMER.

It is claimed for this structure that the channel *cd*, although containing air, only slightly increases the resistance of the magnetic circuit by reason of its great breadth compared to its width, and by leading all of the lines of force transversely through the coils increases considerably the rapidity of magnetization and weakens the effect of hysteresis. The thin iron plates are separated by an air space, thus completely avoiding a generation of Foucault currents and increasing the surface of exposure and the facility for cooling.

IRON-CARBON STORAGE BATTERY.

Storage battery improvements are so generally confined to differences in the character of the electrodes and so generally confined to lead as the material constituting the elec-

trodes that any departure from this beaten track is watched with interest. It is more than likely that the storage battery of the future will be one which does not contain lead. What are the merits of the battery about to be described in a commercial sense we are unable to state. It was invented by Mr. Isaiah L. Roberts, of Brooklyn. It comprises two carbon and iron electrodes separated by a porous diaphragm and an electrolyte of chloride of iron. The passage of the charging current decomposes the chloride of iron in solution in the iron compartment, carrying the chloride over to the carbon electrode and depositing metallic iron on the iron plate. The transferred chlorine is taken up by the chloride of iron in the carbon or anode compartment, one additional atom of chlorine being absorbed for each two atoms of iron present in the chloride of iron solution (FeCL) in the carbon compartment, forming sesquichloride of iron (Fe_2CL_3), and this continues until the solution in the iron compartment is depleted or that in the carbon compartment has absorbed its full quota of chlorine. The return to the original conditions existing before the electrical current is passed through the battery, it is said, is not affected to any appreciable extent until the circuit between the electrodes is closed, because, owing to the fact that the fluids on opposite sides of the substantially impervious diaphragm are not permitted to intermingle, the local action is very slight. On closing the circuit of the battery the sesquichloride returns to the condition of chloride of iron and the excess of chlorine goes back to the iron electrode, with which it recombines.

Jerry Simpson Wants a Postal Telegraph.

The nine Alliance members of Congress will hold a conference immediately after the holidays and determine upon the best line of action to secure the legislation they desire. Representative Simpson said that he could not outline the policy of his colleagues, except so far as to say that they would stand together.

"Among other things," says Mr. Simpson, "we want the money of the country circulated by the general government; we want postal savings banks and governmental control of railroads and telegraph companies.

"To a slight extent Postmaster-General Wanamaker favors our idea in the matter of postal telegraphy, but his party will not sustain him and there is little use to look for assistance from that quarter."

Type Setting by Telephone.

One of the most useful and unique accounts to which the telephone has ever been turned is that adopted by the management of the London *Times*. Wires have been laid in an underground railway tunnel, between the *Times* composing room, in Printing House square, and the Parliamentary reporters' gallery, in the House of Commons. A copy reader is placed at each 'phone and he reads the stenographic "turns" from the note book as fast as it is possible for the compositors to take them on typesetting machines, over in the Times building, a mile and a half away. The hearing apparatus is fastened to the ear of the compositor in the same manner as our "Central" telephone offices, and the reader himself must constantly listen for the interruptions and necessary repetitions. The uproar in the regular reporters' room in the House has driven a great many of the readers into other parts of the building. Hence, upon almost any night during the session of Parliament, one may witness the novel spectacle of dual debates in and out of the chamber—the M. P.'s and the readers—and it is no hyperbole to say that the elocutionary odds are in favor of the latter.

At first the reporters did not approve of the innovation, but when the *Times* men found they could dictate their notes through to the composing room without the labor of transcribing them they quickly availed themselves of the opportunity, though, as a matter of necessity, they receive proofs for correction. Each machine can produce from five to six columns of solid minion a night.

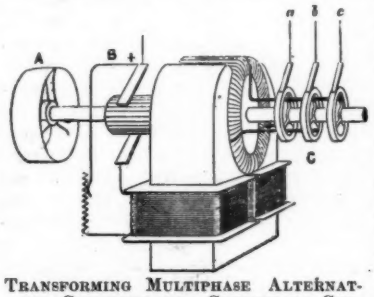
Of course, errors creep in, but on the whole the scheme works well; and the fact that it enables the *Times* to print in time for the 5 A. M. newspaper trains, going to all points of the United Kingdom, the whole of debates that are often continued until 3 A. M., is an earnest of the plan's permanency.

Transforming Multiphase Alternating Currents into Continuous Currents.

("E. H." in London *Electrical Review*.)

After discussing the application of polyphased alternate currents to the production of lighting by incandescence and of motive power, we are naturally led on to the study of the processes by which these currents can be transformed into continuous currents to meet the requirements of electro-chemical operations, the charging of accumulators, and other applications to which we shall have occasion to refer. These transforming apparatus, to which we give the provisional name of multiple transformers, are now invented and practically realized. The Frankfort Exhibition has made us acquainted with two very distinct types, one for triphased currents, devised by M. Dolivo Dobrowolsky, and the other for diphased currents, by M. Schuckert. We will in this article discuss the triphased multiple transformers; the corresponding apparatus for diphased alternate currents will be described when we come to diphased currents.

In order to thoroughly understand the principle of the multiple transformers, to which, properly speaking, we should give the name of "continuous current and polyphased alternate current generator motors," we have merely to glance at the figure below, which shows the apparatus reduced to its essential elements: A Gramme ring provided with collector and brushes, excited either in derivation or by a separate source. To three points of the winding, 120 degrees



TRANSFORMING MULTIPHASE ALTERNATING CURRENTS INTO CONTINUOUS CURRENTS.

apart, are connected three derivation wires communicating with three insulated collecting rings, on which rub three brushes connected with three wires, *a*, *b*, *c*. A pulley is fixed upon the axle bearing the ring and the collector. We will represent by A the pulley, by B the collector and its brushes, and by C the three collecting rings, *a*, *b* and *c*, and their brushes.

An apparatus constructed in this manner is capable of six essentially distinct functions, and this justifies the length of the name which we have coined in order to define it.

1. By making the pulley, A, turn mechanically, we get at B a continuous current. Thus the system works as a continuous current dynamo, and is really nothing else.

2. By supplying a continuous current at B the ring is made to turn, and mechanical power is obtained at the pulley, A. In this second case we have a continuous current motor. These two functions are well known, and we only mention them with the idea of giving a complete list of all the functions of which the apparatus is capable.

3. By supplying mechanical power to the pulley, A, it turns, is excited, and is, as we have seen, capable of producing continuous current at B. But if, instead of collecting the current at B, we collect it at C, on the three brushes, *a*, *b*, *c*, we shall obtain triphased alternate currents, and we shall thus get a triphased alternate current generator, which is self-excited by a continuous current which it produces itself. This is a very convenient method of constructing, at little expense, a triphased alternate current generator. Any shunt dynamo lends itself readily to this transformation by the addition of three rings on the extremity of the axle opposite to the collector and connecting these rings to three points of the armature windings selected at 120 degrees apart.

4. By supplying triphased alternate currents to the three rings, *a*, *b*, *c*, when once synchronism is established between the angular speed of the axis of rotation and the frequency of the alternating currents, we get a synchronous alternate current motor, and collect mechanical power at the pulley, A. The apparatus thus works as a synchronous alternate current motor. It must be observed that the working of this synchronous motor differs essentially from that of the motors with a revolving magnetic field which we have described in a former article. These motors can, in the first place, be only started when free, without any load and when not excited. The initial torque is produced by the reaction of the armature on the inductors. When synchronism is obtained the machine can be excited with its own current, and under these conditions, this synchronism is kept up, even when the machine is loaded, but it is indispensable to the working. The revolving field motors have the property of slackening their speed with the charge, and are even capable, if the resistance of the induced circuit is made to vary, of turning at any speed whatever. The alternate current motors, such as we have described, either turn synchronously or stop. We, therefore, mention this property of the multiple transformer without, however, attaching any practical importance to this fourth special function.

5. On continuous current being supplied to the brushes, B, the apparatus turns, is excited, and triphased alternate currents are collected at C. Thus we have a transformer of continuous currents into alternate triphased currents. Of course, any winding whatever of a continuous current dynamo furnished with the three collecting rings can be made to act in the same way. M. Dolivo Dobrowolsky, at the Frankfort Exhibition, used the drum-winding, taking the continuous current from accumulators and transforming it into triphased alternate currents working his little revolving field motors during the stoppages of the Lauffen transmission. In a recent paper of the *Société Internationale des Electriciens*, the writer of these articles used, for the same purpose, a small series continuous current dynamo constructed by M. Hillairet, with a Gramme ring furnished with three collecting rings, for repeating the principal experiments relating to revolving fields and polyphased alternate currents.

This mode of transformation may be applied to certain special cases when, for instance, it is required to work from a great distance an electric motor that is not easy of access, that cannot easily be examined and attended to, and the sparks of which issuing from the collector entail a certain amount of trouble or inconvenience. The continuous current, when transformed into polyphased currents, can, in such a case, serve to work a revolving field motor without either collector or brushes, and, above all, without sparks.

6. The most important of the transformations which can be effected by means of the apparatus is unquestionably that of which we have now to speak. By sending into C triphased alternate currents, the apparatus is made to turn synchronically with the frequency of the alternating current, and continuous current is collected at B. The apparatus is a transformer of triphased alternate currents into continuous current. The mode of transformation is similar, but of a contrary nature, to that which we described when speaking of the fourth function of the multiple transformer. We can see that by connecting utilizing apparatus at B, these latter will be traversed by continuous currents, and may be either motors, accumulators, electrolytic baths, etc., as required. We shall have occasion to describe an application of this kind, namely, the working of many little motors, made by M. Schuckert with his diphased alternate currents.

From what we have just said, we see that it is possible to conceive a great number of continuous current and polyphased alternate current motor generators, by suppressing those parts that are useless for certain special applications, and by giving the essential organs known arrangements combined in different ways. We have been careful to describe the principle only of these curious transformations, not entering into questions of priority which our present information will not enable us to decide, or even to study, with any degree of completeness. In a subsequent article we shall discuss the apparatus for producing, transforming and utilizing diphased alternate currents, and we shall, in conclusion, endeavor to establish a comparison between these two systems and that of simple alternate currents.

Joe Howard at the Electric Club.

A meeting of the New York Electric Club will be held New Year's Eve. The address of the evening will be by Joseph Howard, Jr., the well known newspaper man and a member of the Club. Mr. Howard will give the members "A Few Plain Words on Journalism." The affair will be entirely informal and a large attendance is expected.

TELEGRAPHIC

.... Dr. Murray, manager of the Western Union Telegraph Company's office at Atlanta, Ga., has resigned. Mr. D. C. Sims, the present manager at Mobile, Ala., has been appointed in place of Dr. Murray.

.... The Central and South American Cable and Telegraph Company has increased its capital from $6,000,000 to $6,500,000. The increase is for the purchase of the Transandine Telegraph Company lines.

.... The stockholders of the American District Telegraph Company will meet on January 12, to vote on the proposition to increase its capital stock to $4,000,000, and to ratify the purchase of the Mutual District Messenger Company and the Mutual District Telegraph Company of New York.

.... The Adirondack and St. Lawrence Telegraph and Telephone Company has been incorporated to operate in Franklin, St. Lawrence, Herkimer and Hamilton counties, with a capital of $75,000 and these managers: W. S. Webb, H. L. Sprague, E. M. Burns, F. G. Smith, F. Egerton Webb, Jno. H. Prall and James Eagen.

.... The argument for a permanent injunction in behalf of the New York Consolidated Exchange and the Western Union Telegraph Company to restrain the New York Stock Exchange from excluding the Gold and Stock Telegraph Company from receiving the quotations of the exchange for distribution on gold and stock tickers, came on last week at White Plains before Judge Dykman. The Stock Exchange won a big victory in the ticker litigation, as Judge Dykman refused to grant a permanent injunction restraining the Stock Exchange from withholding its quotations.

Another Reciprocity Agreement.

President Harrison is expected to shortly issue a proclamation in reference to the conclusion of a commercial reciprocity agreement between the United States and all the British West Indian Islands and British Guiana. The agreement includes special arrangements with Jamaica, Barbadoes and Trinidad and the Leeward Islands.

Mr. J. H. Howard, general manager of the Tropical American Telephone Company, in speaking of the matter, said: "This new agreement will be of much benefit to our company and I have already established depots of supplies at Barbadoes, R. R. Snickler, agent; Port Antonio, Jamaica, Francis R. Hart, agent; Havana, Cuba, Henry B. Hamel, agent; Ponce, Porto Rico, Messrs. Kramer & Company, agents, where stocks of telephone sets and telephonic apparatus will be kept on sale at reduced prices to supply the demand in the West Indies. The following flattering letter has just come to hand from the Hon. Colonial Secretary at Grenada: 'The type of long distance instruments now supplied by you, which is described as the No. 7 Universal Set, is so much superior to those of German manufacture, hitherto forwarded, that I have to request you to be so good as to fill all my orders for long distance sets with that description. Further, as there is now very little demand for the Bell and Blake sets, I should take it as a favor if you would exchange about 24 sets, which I have not opened as yet, for long distance sets, upon my paying the difference in value.'

"The Consolidated Telephone Maintenance & Construction Company, of London," concluded Mr. Howard, "are desirous that this company take the agency for their instruments in our tropical fields, including Hunning's long distance transmitters, the United States patent on which will expire September 16, 1891, Bell and Blake sets and Gower-Bell sets."

* * An electric railroad is to be built from Springfield, Ohio, through North Hampton, New Carlisle and Medway to Dayton, Ohio.

* * The plant which has been established at Ishpeming, Mich., for the separation of iron ore by electricity is reported to have been very successful. The works have so far turned out 30,000 tons of Bessemer ore.

* * Nathan R. Prentiss, of Lawrence, Mass., has filed an attachment against the Thomson-Houston Electric Company, of Boston, for $3,000, in an action of tort. It is returnable at Salem, Mass., the first Monday in January, 1892.

* * One of three new double-deck Pullman electric cars for the West End street railway has reached Boston. When the other new cars arrive they will all be put on the Cambridge line to keep company with the one now running there.

* * H. Ward Leonard & Company have received an order from Wm. Sellers & Company, of Philadelphia, for two 40 horse-power motors for use upon traveling cranes. The motors are to be supplied under rigid specification, as to dimensions and performance, but the decision as to the particular make of motors to be used is left with H. Ward Leonard & Company.

* * The Lansing, Mich., electric street railway has been sold to the Continental Trust Company, of New York, and reorganized with capital stock increased from $50,000 to $175,000. Messrs. Hollister and Skinner, the former owners, were elected president and secretary. O. M. Barnes and Nelson Bradley are the only other Lansing stockholders. A new power house will be erected and a double track laid to the State Fair grounds.

* * At a meeting in New York, last week, of the managers of the Rochester, N. Y., Railway Company, Manager Minary presented his resignation, which was accepted, to take effect January 1. Mr. Minary will return to his home in Louisville, Ky. At the same meeting President Beckley was instructed to make the attempt of operating the present horse cars of the Park avenue line with electricity. Trucks will be placed under these cars without delay.

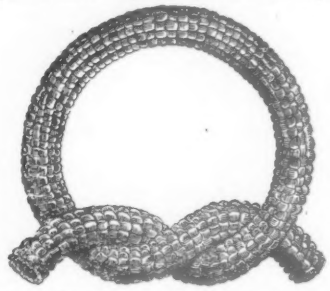
* * The commissioners of the Queen Victoria Jubilee Park, Niagara Falls, Ontario, have reached an agreement with the syndicate who purpose building the electric railway along the bank of the Niagara River. This line will, in time, run from Niagara, on the lake, to Fort Erie, but, for the present, work will be done only on the section between Chippewa and Queenston. The syndicate, it is said, gives a bonus of $10,000, and agrees to pay a rental of $10,000 a year. Surveyors are now mapping and staking out the route, which will be located just under the bank, along the Western boundary of the reservation.

* * Rumford Falls, Me., with all its wonderful natural advantages, has one of the finest water-powers in New England. Located upon the Androscoggin, 75 miles from Portland, it has a water-power of fully 37,000 horse-power, which is secured against drought by the extensive reservoir system at the Rangely Lakes. An idea of the magnitude of the power may be obtained from the fact that there is a fall of 182 feet in less than a mile, which offers ground for the name of "New England's Niagara," which is applied to the property. The Rumford Falls Power Co., of Portland, Me., who are the possessors of this splendid property, are offering extraordinary inducements to manufacturers to locate there.

Herrick's Patent Conduit for Interior Wiring.

Many attempts have been made since the introduction of the interior system of conduit wiring to produce the ideal system. Mr. Charles H. Herrick, of Boston, Mass., has departed from the accepted idea of short rigid tubes, and his invention is now being placed on the market by the well known American Circular Loom Company, of the same city, whose success in the manufacture of insulated wires has brought them to the front in the past two years.

Briefly, Mr. Herrick's device consists of a spiral of insulating or other material, taped reversely with a heavy flexible tape, and the whole protected with a strong woven jacket of cotton or other material, forming an insulated hose or tube. This form of tubing furnishes and combines the three prime factors of a successful tubing for interior wiring, to wit: Flexibility, insulation and cheapness. Flexibility, as the convolutions are left a short space apart; insulation, as the tape and woven cover absolutely produce it, and cheapness, as the system does away with all joints and elbows and their attendant cost. Not only in the field of electrical wiring is this product of high value, but as a speaking tube it will at once find a place. It is practically indestructible, and cheaper than anything now offered for the purpose. The severe tests to which the owners of the system have subjected it, lead them to pronounce it thoroughly waterproof, perfectly flexible and practically non inflammable. They have every reason to believe that the sale and use of the article by electrical engineers and contractors is only limited by the ability of the American Circular Loom Company to manufacture it.



HERRICK'S FLEXIBLE INTERIOR CONDUIT.

P. & B. Paint.

This letter was recently sent by Mr. George P. Low, electrical inspector for the Pacific Insurance Union, 307 Sansome street, San Francisco, to the Paraffine Paint Company, San Francisco, which company manufactures the P. & B. insulating compounds on the Pacific coast and for the territory west of the Rocky Mountains, being a sister company of this company. Mr. Low writes to the Paraffine Paint Company, under date of November 16, 1891, among other things, the following:

"Permit me to express appreciation of the inestimable benefit you have conferred upon the electrical industry in perfecting and bringing out your P. & B. electrical compound. I know of nothing in the way of an insulating paint for all round work that is comparable to it."

The Pacific Insurance Union controls the entire insurance work of the Pacific coast, and early this year Mr. Low made tests of all the insulating materials offered for sale on the Pacific coast, so as to determine on the safest insulation for the wiring of buildings. This was done for the Insurance Union, as electricity was becoming so generally used for buildings on the coast. Severe tests of the compounds were made, the P. & B. standing the tests better than anything else, and it is now compulsory that P. & B. be used in all electrical work which comes under the control of the Pacific Insurance Union.

The Pacific Postal Telegraph-Cable Company are painting their bare wires on the Pacific coast with P. &. B., and it has been demonstrated that wires so painted have worked perfectly during the heaviest rains and the densest fogs, while through the unpainted wires not a tick could be heard at such times.

Solid Mica Insulating Joint.

The accompanying illustration shows sectional views of the mica insulating joint manufactured by the W. T. C. Macallen Company, Boston.

The insulation consists of sheets of superior mica, cut in suitable size, placed between the flanges, which are then compressed and riveted together.

The device possesses other novel features which never before have been applied to an insulating joint.

Among these novel features is the one of coating the outside of the joint with an insulating compound preventing contact by live wires or the creeping of moisture.

FIG. 1.—THE HERRICK INSULATING JOINT.

The W. T. C. Macallen Company has a nicely equipped factory, at No. 161 High street, Boston, where a variety of useful electrical specialties will be manufactured under the supervision of Manager Louis McCarty.

WORLD'S FAIR NOTES.

Each of the big iron trusses that are to support the roof of the Electricity Building weighs 18 tons. There are 40 of these trusses, 115 feet high and the span, 110 feet. Last week the first one was raised. Contractors expect to put them up at the rate of two a day from this time forward.

The committee on electricity has compromised the differences existing between Chief Burnham and Chief Barrett. Rules prepared by each chief for the government of exhibitors in the electricity department will be printed and sent out together. Chief Burnham is to have charge of all electric appliances secured as exhibits up to the time the exposition opens. After that time they will be under the control of Professor Barrett.

The largest amount of World's Fair stock that has been subscribed for in any one week since Chicago was chosen as the site of the exposition has just been taken by a number of Eastern firms. More than $36,000 in stock has been subscribed for during the last week. These are the subscribers: Enoch Morgan's Sons & Company, New York, $10,000; Singer Manufacturing Company, New York, $10,000; Washburn & Moen Company, Worcester, Mass., $5,000; John A. Roebling's Sons Company, Trenton, N. J., $5,000; White Sewing Machine Company, Cleveland, Ohio, $2,000; Van Nortwick Paper Company, Batavia, Ill., $2,000; Valentine Varnish Company, Newark, N. J., $1,000; D. B. Shipman White Lead Company, Chicago, $1,000; W. H. Stubbings & Company, Chicago, $250.

The New York Safety Steam Power Company has also subscribed for $250, and Mallory, Son & Company for $200.

"This is pretty good evidence that Eastern men are interested in the exposition," said Chief Spruance, of the subscription department. "Our agents have been encouraged very much by many of the largest firms in the Eastern States. They have just commenced to solicit subscriptions there, and the result is very gratifying. Some of the firms that have subscribed are taking as much stock as they signed for when New York was trying to get the Fair."

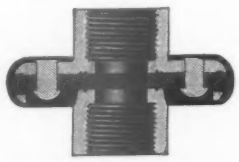


FIG. 2.—THE HERRICK INSULATING JOINT. —SECTION THROUGH CENTER.

The Trolley Wins in Brooklyn.

The Railroad Committee of the Brooklyn, N. Y., Board of Aldermen reported favorably December 21 upon the joint application of the Brooklyn City, Atlantic Avenue, Coney Island and Brooklyn, and Brooklyn City and Newtown (DeKalb Avenue) Street Railroad Companies, for permission to use the overhead trolley system of propelling cars as a substitute for horses. The application was made a month ago and three public hearings were given in the City Hall. The application covers all the principal street car lines in the city. There is very little doubt that the resolutions will be approved by the Mayor, and all obstacles to the introduction of the electric trolley in Brooklyn removed.

The resolutions provide that the poles used by the companies shall be of iron or steel and not less than 20 feet high, except where it may be necessary to shorten them for the purpose of operating under the elevated roads. When the tracks are in any street in which there is no curb line adjacent to the tracks, the poles may be placed no less than 12 feet to the nearest curb. Ordinarily the poles must be erected on the curb line of the streets, and, with the consent of the owners, the companies are permitted to use the elevated railroad structures. The rate of speed is not to exceed 10 miles an hour. All excavations and other operation in the constructions of the roads must be done under the supervision of the Board of City Works, and each company must file an indemnity bond of $150,000, to secure the city against possible damage. According to a supplemental resolution of the Common Council, the companies must also forthwith file the consents of the abutting property owners.

The Atlantic Avenue Company already has the consent of the State Board of Railroad Commissioners to use the trolley in Atlantic and Fifth avenues, and the Coney Island and Brooklyn Company has the right to use it in Ninth avenue and Fifteenth street. The Brooklyn City Company has recently increased its capital stock so as to provide for the cost of making the changes. By the introduction of the trolley 10,000 horses will be released from service on the cars. It will take several years to make the change on all the lines.

The City Railroad Company's estimate of the cost of the change on all its lines is $6,000,000, while President Richardson, of the Atlantic Avenue Road, places the cost to his company at $1,500,000. The cost to the other two companies, the Brooklyn City and Newtown and the Coney Island and Brooklyn, will foot up about a million.

LITERARY.

"Transactions of the American Institute of Electrical Engineers" for November, 1891, has come to hand.

Funk & Wagnalls Company, New York, have issued a special holiday edition of Sir Edwin Arnold's "The Light of the World."

"Annual Report of the Chief of the Bureau of Steam Engineering" for 1891 has been received from the Navy Department.

The annual circular of the Newark, N. J., Technical School for 1891-2 has been received. Such institutions are rapidly becoming more numerous and are doing a great deal of good.

The Christmas numbers of the comic weeklies, *Puck*, *Judge* and *Life*, and the magazines for December, appear in beautifully colored and specially designed covers. The foreign weeklies are equally splendid as to external appearances.

Under the head of "Ninety Miles in Eighty-nine Minutes," the general superintendent of the New York Central Railway contributes to the January number of the *North American Review* a picture of the life and work of locomotive engineers.

Frederick C. Smyth, recorder of the city of New York, and one of the most famous criminal judges in the country, has written a remarkable article for the January *Scribner*, entitled, "Crime and the Law," in which he makes some pertinent suggestions for the reform of criminal procedure in New York.

The article of the month which will attract the great circle of readers is one on "Phillips Brooks—His Youth, Early Manhood, and Work," in January *New England Magazine*. The writer, the Rev. Julius H. Ward, is an intimate of the great preacher, and this is the first time that any magazine has given anything like an adequate account of the man or a real estimate of his work.

The South Armory, Boston.

The accompanying illustration shows the drill shed of the South Armory on Irvington street, Boston, in process of construction. The iron roof trusses and purlins were manufactured and erected by The Boston Bridge Works. There are 9 trusses, 130 feet span, with a height of 65 feet at the center; the building is 300 feet in length. All of the material is of iron and weighs 300 tons. The trusses were erected in less than three weeks.

Since building the armory shown in the illustration, The Boston Bridge Works has built another in Boston which is an exact duplicate. They have also built other State armories smaller in size, but of similar design, at Fitchburg and Lowell, and another for the Salem Cadets, at Salem. These armories are built by an Armory Commission and are used for drilling the State Militia.

The same company is now constructing the roof trusses for the Lynn and Boston Railway Company's new power station on Washington street, Lynn.

A Flexible Combination Lighting Plant.

President J. H. McClement, of the Twin City Construction Company, New York, discussed combination electric lighting plants with a member of the REVIEW staff the other day, and mentioned the plant his Company has installed at Winston-Salem, N. C., as an example.

"We are running a combination street railroad, Brush arc light, and an Edison incandescent system," said Mr. McClement. "We have not sufficient business to justify us in running the incandescent system for 24 hours, so we shut down about 1 A. M. Our arc machines are up to full capacity. In one of the outlying portions of the city about 12 more arc lights are required, and we have made arrangements to furnish additional business with the railway machine by means of the Universal constant potential lamp to run from the railroad circuit. By this means we are enabled to run the incandescent system all night by buckling on to the same engine which runs the railway generator, a pair of incandescent machines, so you see that by this arrangement the following results are accomplished: First—the railroad circuit has current on it for all night, which in case of emergency can be used. Secondly—we will eventually build up a good load for all night arc lighting from the railway generator, thus getting 24 hours service from this apparatus. Thirdly—it enables us to economically turn the station into a 24 hour incandescent system."

Patent New Year Resolves.

I will get up and dress when the breakfast bell rings.

I will not complain when everything goes to suit me.

I will treat my wife as politely as though she was a perfect stranger.

I will strive to be more thoughtful for my own comfort, that others, seeing me happy, may also endeavor to be contented.

I will not spend so much money this year on the useless frivolities of life.

I will remember the poor if I have to make a memorandum to that effect every morning.

I will endeavor to impress upon my family the duty of greeting, with cheerful voices and laughing faces, the father of a family when he returns home, wearied with the depressing cares and labors of a long business day.

I will go out by myself oftener, in order that my family may enjoy the tranquil and improving pleasure of a long, uninterrupted evening in the quiet sanctity of a happy home.

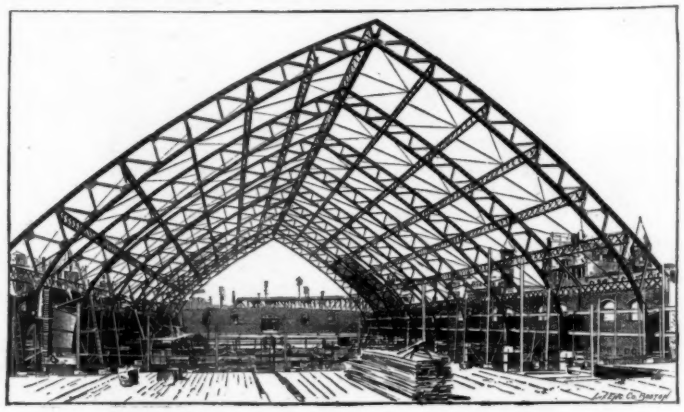
I must be more unselfish, and take better care of myself that I may long be spared to be the joy and light of the home which it has pleased an appreciative Providence to bestow upon me.

I will pay my pew rent this year, if I have to deny myself a new overcoat, and my children have to go without shoes. I feel that we have not heretofore sufficiently denied ourselves in little luxuries for the sake of maintaining a good appearance at church.

I will be, in all things, an affectionate husband, a loving father, a good provider; and I will rear up a family that will love and respect me, and render to me prompt and cheerful obedience, with perfect deference to my wishes and thoughtful regard for my comfort, or I will break their backs in the attempt.—*Burdette, in The Ladies' Home Journal.*

The First Telephone Exchange.

The city of New Haven, Conn., was the first place in which the telephone was put into practical exchange use and its capabilities of transmitting and receiving messages direct from the human voice demonstrated, says the New Haven *Register*. Looking now upon the widespread, universal use of the "Hello" apparatus one would scarcely think that it was but 13 years ago that it was introduced among a comparatively few number of subscribers. But such is the fact, a fact now passed into history and which is, perhaps, distinctly remembered by few people only. The struggles of the Bell Telephone Company in the early years of its existence seemed to center about New Haven, because of its being the first city in which a company working under its patents was successful, and because it was here that the fight between the Bell Telephone Company and the Western Union Telegraph Company waged the hottest. It was here, too, that two gentlemen, both residents of New Haven, by indomitable pluck, courage and shrewd business ability, performed wonders with the crude instruments then at hand, and by various improvements succeeded in making the telephone capable of doing practical work. In consideration of these facts the Connecticut Historical Society is collecting material bearing upon the subject and they are being assisted in the work by George W. Coy, now a resident of Milford, who, together with the late H. P. Frost, were the pioneers of the telephone exchange system. Mr. Coy has in his possession many letters and documents which give a full history of the telephone companies in New Haven, Hartford, Springfield and Holyoke. From them an interesting history can be obtained.



THE SOUTH ARMORY, BOSTON.—BUILT BY THE BOSTON BRIDGE WORKS.

The efforts of Messrs. Coy and Frost to establish the district telephone exchange system are oftentimes laughable, now that they are viewed from a distance, but to them these were no laughing matters at that time. Mr. Coy received the agency of the Bell Telephone Company for New Haven and Middlesex counties in the latter part of 1877.

Mr. Coy had nothing but his experience to put into the company. Mr. Frost borrowed $650 from his brother-in-law and they went to work. A stock company was organized with a capital stock of $5,000, of which Messrs. Coy and Frost owned $2,000 each and the other $1,000 was given to Special Agent Hayward, of New York, for the use of the telephone for exchange business in New Haven. Walter Lewis was president of the company, Mr. Coy was superintendent and secretary, and Mr. Frost was treasurer. In December, 1887, a letter was received from Agent Hayward stating that they must, before they organized, secure 100 subscriptions or else they would have to pay rent on the instruments. They objected to this part of the contact so vigorously that the number was finally reduced to 75. A thousand circulars, containing an application blank for a telephone, were issued and mailed to prominent business men and citizens throughout the town. One reply was received, and that was from the Rev. John E. Todd, who subscribed for a "phone" on the spot. This was scarcely enough to begin business on, so an agent was sent out to solicit subscriptions, he receiving $1 a piece. He was very successful, and by the end of February they had 150 orders ahead.

On January 28, 1878, the central office was established in a ground floor apartment of the Boardman building on Chapel street. Mr. Coy and a boy ran the concern. It was at this time that Mr. Coy advised the system of connection and exchange of wires in the central office, and to whom the credit of this invention is due. He copied from the switchboard of a telegraph office, substituting various devices to conform with the requirements of the telephone. The wires were stretched over the housetops, few if any poles were used, and the telephone machine was of a primitive sort, the receiver and transmitter being one. The magnet bell for "calling up" had been invented at that time, but it was too expensive to put in for the price then charged to subscribers, only $18 a year. A "push" button was used for calling up the central office, and "central" called up the subscriber by the "squealer," a device which sent a shrill noise through the telephone receiver, which could be heard in a room of ordinary size. It was called Coy's "chicken." The New Haven Flour Company, of which George E. Thompson was the head, was the first subscriber, and the firm was the first to use a telephone exchange in the country. The second subscriber was the firm of Stone & Chidsey. At that time there was no lightning protector in the telephones. It was the custom during an electrical storm to disconnect the wires at the central office, but one evening when the office was left in charge of the boy this was forgotton, and a vivid flash of lightning burned out Stone & Chidsey's telephone, but Mr. Coy arrived on the spot first, took the telephone out and substituted another without anybody being the wiser. For if it had been known that the telephone attracted lightning their business would have been ruined. The next day a lightning arrester was placed in every telephone. Among the printed instructions to subscribers was the following: "Do not talk with your ear or listen with your mouth."

Exchanges were soon started in Lowell, Mass., and Albany, N. Y., but it was several months before anything was done in this line in New York city or Boston, and our neighboring city of Bridgeport was about nine months behind New Haven in this matter. In the meantime it was noised abroad that New Haven had a new and peculiar telephone business, and the result was that floods of letters came to Mr. Coy making inquiries about his system. Some of these were answered, but many of the lengthy letters found the waste basket. Many men came from distant cities, some with letters from Professor Bell, to see what these Yankees were doing. Letters were received from London and other English cities, asking for information.

In a very short time Messrs. Frost and Coy began to look about them to enlarge their business. They had by this time 450 telephones in use in this city. In order to invade other cities they must have more capital. Accordingly a State company was formed with a capital stock of $40,000. It was known as the Connecticut District Telephone Company. Frost was president, Coy superintendent and secretary, and Frost, Coy and the late ex-Governor Bigelow were the directors. Hartford was considered to be a good field to work, provided it was worked in the proper way, and an ingenious scheme was devised. An Automatic Fire Alarm and Signal Company had just been organized in New York. They paid this company $15,000 in the new telephone stock for the privilege of using their inventions. Then they hired a good organizer, a man by the name of Glen, and sent him to the capitol city. Mr. Glen immediately set out on his mission and "tackled" the representative insurance men of the town. Naturally he found little difficulty in interesting them with the automatic fire alarm, because it affected their line of business. From the fire alarm he passed to the telephone by easy stages, and managed to get them so much interested in that, too, that such men as James G. Batterson, Mr. Chase, Mr. Pond, Mr. Fisher and the late Samuel Jones, the noted criminal lawyer, and others took $10,000 worth of

(*Continued on page 265.*)

ELECTRIC LIGHT NEWS

—— The Dallas, Tex., Electric Light Company has increased its capital stock to $100,000.

—— The citizens of Oakland and Carson, Ia., are talking of combining to secure electric lights for the two towns.

—— The Detroit Electric Works' dividend of two per cent. is payable January 15, 1892, to stock of record December 31.

—— Another stationary engine of 150 horse-power has been placed in the Lock Haven, Pa., Electric Light and Power Company's plant.

—— The Annapolis, Md., City Council will petition the Legislature to empower it to issue bonds amounting to $90,000 for an electric light plant and a reservoir.

—— Two petitions for foreclosure were filed last week against the Dubuque, Ia., Electric Light and Power Company. They were made by the Davenport Foundry and Machine Company, which holds mechanics' liens for small amounts.

—— The franchise held by the Jenney Electric Light Company for the city of Pekin, Ill., has been forfeited for non-compliance with an ordinance requiring that lights must be burning six months after the granting of the franchise.

—— The effect of the adoption of the electric light in the Public Library at Newcastle, Eng., has been to reduce the amount of the insurance premium by a large amount, and will also result in a saving of hundreds of dollars a year on the book-binding account. Acid fumes generated by the combustion of gas cause havoc with the leather bindings of books. Where the electric light is used there are no such fumes.

—— The Laclede Gas Light Company, St. Louis, will double the capacity of its incandescent electric lighting plant, and has ordered two 250 horse-power compound condensing Armington & Sims engines, with Blake pumps, and independent condensing apparatus. This work was awarded, after strong competition from all the leading high speed engines. It is expected that one of these engines will be in operation by January 1, 1892, and the other shortly thereafter. The first engine will be belted direct to a 2,500 light alternator. The foundations will be carried to solid rock.

—— Charles E. Heron last week entered suit against the Philadelphia Edison Electric Light Company to recover $25,000 damages for injuries received on February 4, 1890, at the company's works, Sansom street, above Ninth. He was erecting a boiler when another boiler burst and the scalding steam was poured over him. He was taken to the Jefferson Hospital, where he lay between life and death for several days. He claims to be permanently injured and says the accident was due to the neglect of the defendants who were using an unsafe boiler, and that they were working it beyond its capacity.

—— Mortgages aggregating about $4,900 and a judgment for $300 were filed for record by the creditors of the Hastings, Neb., Electic Light Company, last week, against the company. These liens are subject to a prior mortgage of $11,000. There is also a chattel mortgage of $1,250 on some of the machinery, and a mechanic's lien of about $1,500 on the property. These liens, mortgages and accrued interest make a total of about $21,000 indebtedness. There is a prospect of the matter being adjusted in the district court. Mr. George B. Johnson, the manager of the company, states that while he cannot tell the future of the plant, it will no doubt be continued in operation as at present.

Early Experiments in Electroculture.

A REVIEW OF THE WORK DONE IN THIS INTERESTING FIELD—FROM A BULLETIN ISSUED BY THE CORNELL UNIVERSITY AGRICULTURAL EXPERIMENT STATION.

The first experiment to determine the influence of electric light upon vegetation was made by Hervé-Mangon in 1861. (Compt. Rend. 53, 243.) This experiment showed that the electric light can cause the production of chlorophyll or the green color in plants, and also that the light can produce heliotropism or the phenomenon of turning or bending towards the light.

In 1869 Prillieux (Compt. Rend. 69, 410) showed that the electric light, in common with other artificial lights, is capable of promoting assimilation, or the decomposition of carbon dioxide and water.

The next experiments appear to have been those of C. W. Siemens, in England, and P. P. Dehérain, in France. These two, with our own, appear to be the only definite investigations of the subject upon what may be called a practical or horticultural scale.

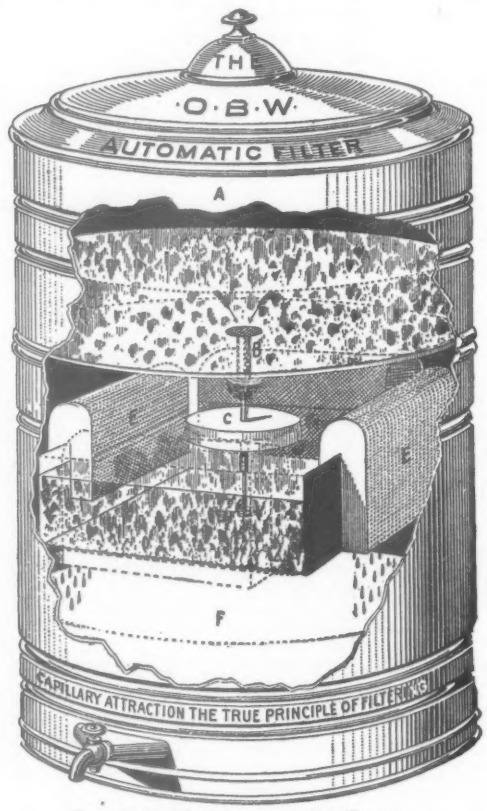
The English experiments, although eminently practical, were conducted by an electrician, and the French were largely confined to physiological problems. It seemed proper that the third series of experiments should be approached from the particular standpoint of the gardener.

Dr. Siemens' experiments (Proc. Royal Soc., xxx, 210 and 293. Rep. British A. A. S., 1881, 474. See also abstract in *Nature*, xxi, 456, March 11, 1880, and an editorial in the same issue) may be divided into two series; in one series the lamp was placed inside the greenhouse, and in the other suspended over it. In both cases he observed marked effects upon vegetation in a short time. A great variety of plants was treated. The dynamo which Siemens in his first experiment used "makes 1,000 revolutions a minute, it takes two horse-power to drive it, and develops a current of 25 to 27 webers of an intensity of 70 volts." "The light produced is equal to 1,400 candles measured photometrically." When the lamp was placed inside the house, plants within three or four feet of it suffered much, the leaves of melons and cucumbers "which were directly opposite the light turning up at the edges and presenting a scorched appearance." When these injured plants were removed to a distance of seven or eight feet they showed "signs of recovery, throwing out fresh leaves and pearls of moisture at their edges." In general, all plants which were exposed to normal conditions during the day and to six hours of electric light at night, "far surpassed the others in darkness of green and vigorous appearance generally." The flavor was fully as good in the electric light fruits as in the others. These results were supplemented by a larger experiment in the Winter of 1880-81. In this case a lamp of 4,000 candle-power was used, and it was placed inside a house of 2,318 cubic feet capacity. The light was run all night, and the arc was at first not protected by a globe. The "results were anything but satisfactory," the plants soon becoming withered. At this point a globe of clear glass was placed upon the lamp, and thereafter the most satisfactory results were obtained. Peas, raspberries, strawberries, grapes, melons and bananas, fruited early and abundantly under continuous light—solar light by day and electric light by night. The strawberries are said to have been "of excellent flavor and color," and the grapes of "stronger flavor than usual." The bananas were "pronounced by competent judges unsurpassed in flavor" and the melons were "remarkable for size and aromatic flavor." Wheat, barley and oats grew so rapidly that they fell to the ground of their own weight. The beneficial influence of the clear glass globe was, therefore, most marked. "The effect of interposing a mere sheet of thin glass between the plants and the source of electric light was most striking. On placing such a sheet of clear glass so as to intercept the rays of the electric light from a portion only of a plant—for instance, a tomato plant—it was most distinctly shown upon the leaves. The portion of the plant under the direct influence of the naked electric light, though a distance from it of nine or ten feet (it is to be observed that the light used by Dr. Siemens in this case was 4,000 candle-poweer, while ours was but 2,000), was shrivelled, whereas that portion under cover of the clear glass continued to show a healthy appearance, and this line of demarkation was distinctly visible on individual leaves; not only the leaves but the young stems of the plants soon showed signs of destruction when exposed to the naked electric light, and these destructive influences were perceptible, though in a less marked degree, at a distance of 20 feet from the source of light."

In the other series of experiments, Siemens placed an electric lamp of 1,400 candle-power about seven feet above a sunken melon pit which was covered with glass. The light was modified by a clear glass globe. In the pit seeds and plants of mustard, carrots, turnips, beans, cucumbers and melons were placed. The light ran six hours each night and the plants had sunlight during the day. In all cases those plants "exposed to both sources of light showed a decided superiority in vigor over all the others, and the green of the leaf was of a dark rich hue." Heliotropism was observed in the young mustard plants. Electric light appeared to be about half as effective as daylight. A great difficulty experienced in this experiment was the film of moisture which condenses on greenhouse roofs at night and obstructs the passage of light. The light was at one time suspended over two parallel pits nearly four feet apart, and the effect was observed upon plants under the glass and in the uncovered space. In all cases the growth of the plants was hastened. Flowering was hastened in melons and other plants under the glass. Strawberries, which were just setting fruit, were put in one of the pits and part of them were kept dark at night while the others were exposed to the light. After 14 days, the light having burned 12 nights, most of the fruits on the lighted plants "had attained to ripeness, and presented a rich coloring, while the fruit on those plants that had been exposed to daylight only had by this time scarcely begun to show even a sign of redness." He concludes that a lamp of 1,400 candle-power produced a maximum beneficial result on vegetation at a distance three metres (nearly ten feet) above the glass, but "the effect is nevertheless very marked upon plants at a greater distance."

At the close of his experiments Siemens was very sanguine that the electric light can be profitably employed in horticulture, and he used the term "electro-horticulture" to designate this new application of electric energy. He anticipated that in the future "the horticulturist will have the means of making himself practically independent of solar light for producing a high quality of fruit at all the seasons of the year." He had shown that growth can be hastened by the addition of electric light to daylight, that injury does not necessarily follow continuous light throughout the twenty-four hours, that electric light often deepens the green of leaves and the tints of flowers, and sometimes intensifies flavors, and that it aids to produce good seeds; and he thought that the addition of the electric light enabled plants to bear a higher temperature in the greenhouses than they otherwise could. But whatever may be the value of the electric light to horticulture, the practical value of Siemens' experiments is still great. They have furnished data in several obscure relations of light to vegetation. *Nature* made the following comments upon this feature of the application of the electric light by Dr. Siemens: "But the scientific interest of its present application must rest mainly on the fact that the cycle of the transformation of energy engaged in plant life is now complete, and that, starting from the energy stored up in vegetable fuel, we can run through the changes from heat to electricity, and thence to light, which we know we can store up in vegetable fuel again."

Dehérain's experiments (Ann. Agronom. vii, 551, 1881) were conducted at the Exposition d' Electricité, Paris, in 1889. A small conservatory standing inside the exposition building was divided into two compartments. One compartment was darkened and the glass painted white upon the inside; this received the electric light and all solar light was excluded. The other compartment was not changed. The amount of sunlight which the plants normally received in this conservatory within an exposition was not sufficient to maintain a healthy growth. A lamp of 2,000 nominal candle-power was used. At first the naked electric light was used and it ran continuously. Barley in head and flax in flower were brought into the lighted compartment; also chrysanthemums, pelargoniums, roses, and a variety of ornamental plants. After seven days of continuous electric lighting, most of the plants were seriously injured. All the pelargoniums lost their leaves, cannas were discolored, four o'clocks were tarnished and bamboos were blackened. "But the most curious effect was produced upon the lilacs; all the parts of the leaves that had received the direct rays from the lamp were blackened, while those protected by the upper leaves preserved their beautiful green color, and the impression produced upon the epidermis by the electric rays had the clearness of a photographic plate." Similar effects were produced upon azaleas, deutzias and chrysanthemums. It was found that this discoloration did not extend beyond the first layer of palisade cells. Plants which received solar light by day and electric light at night only were injured in the same manner, but in a less degree. The injury was most marked upon the old leaves. The pelargoniums soon sent out new shoots and the young leaves resisted the action of the light much longer than did the mature ones. The flax continued to grow and the barley ripened. It was found that plants under the electric light alone were able to assimilate, but the action was very slow. As much assimilation took place in an hour on a bright Summer day as in several days of electric light. At the expiration of two weeks the condition of the plants was so bad that a change was made, and thereafter a globe was used upon the lamp.



THE O. B. W. AUTOMATIC OIL FILTER.

Chicago's New Masonic Temple.

The Chicago office of the Thomson-Houston Electric Company has produced a very unique and effective advertisement. A large frame contains a handsome colored lithograph of the immense skyscraping Masonic Temple, now in process of erection at Chicago. Back of the lithograph and enclosed in a box are several incandescent lamps. The windows of the Temple are filled with transparent paper, so that when the lamps behind them are connected to any convenient source of current, the picture of the building presents a very life-like appearance. Thomson-Houston apparatus will be used throughout the building.

The O. B. W. Automatic Oil Filter.

The "B. & S." Electric Equipment Company, 115 Broadway, New York city, are selling agents for the O. B. W. automatic oil filter illustrated herewith. The advantages claimed for this filter are those of simplicity, excellence, cheapness and small floor space occupied. Referring to the illustration, the parts of the filter are as follows:

a. Receptacle for dirty oil.

b. Tube for passage of dirty oil to filtering vat D.

c. Float, which raises closing tube B, when oil has reached proper height in filtering vat D.

d. Filtering vat, into which dirty oil passes through tube B.

e. Perforated metal cases hanging over sides of filtering vat D, and filled with absorbant material through which oil is filtered by capillary attraction.

f. Receptacle for pure oil.

This filter is made in three different sizes. It is claimed that by its use a consumer can save from 60 to 90 per cent. of his oil bills.

A Bug on the Quad.

It was just before noon on Friday, when the business of the telegraph companies is briskest. The Baltimore quad in the Western Union office had been keeping four operators in New York and four more in Baltimore busy for several hours. There were stock quotations to send and orders to buy and sell to be received. The sending operators were making their fingers dance upon the keys and the receiving operators were racing their pens over the peculiar brown paper which the company furnishes.

Suddenly the instruments began to clatter like the teeth of a man taken with a chill. This told the telegraphers instantly that the finely adjusted piece of mechanism, by the means of which four messages can be sent over the same wire simultaneously, had got out of order.

"She's busted," said one of the men, and he took immediate advantage of the respite to put in a fresh piece of tutti-frutti.

Wire Chief Durivan was called to adjust the instruments. He puttered over them for some time and then concluded that there was a bug on the wire somewhere between New York and Baltimore. The telegrapher's definition of "bug" is "trouble." The instruments were taken off the wire and the wire was tested. It was found to work splendidly. When the instruments were replaced, however, the wire would not work at all. There were no other instruments available, and connection with Baltimore was completely lost. Messages were piling up on the table and the traffic chief, whose business it is to see that there is no delay to despatches, was almost distracted. Electricians were sent for, and they began a thorough examination of the instruments.

After half an hour's search they found the bug, not on the wire, but on the instruments. It proved to be a Croton bug. It stood on the instrument which regulates the passage of the electric current from the dynamo to the wire in such a way as to connect with its fore and hind legs the positive and the negative currents of the battery, which are necessarily separated by insulation. The bug was dead, of course, and the current of 250 volts had fairly glued it to the metal, thereby forming a conductor and temporarily interrupting business between New York and Baltimore for more than half an hour.

THE FIRST TELEPHONE EXCHANGE.

(*Continued from page 263.*)

the telephone stock. He also sold $3,000 worth of Automatic Company's stock.

In the fall of '78, Frost and Coy went to work in Hartford. There were a few private telephones of the Bell pattern in use then, but no central office system that was efficient. All these wires were bought up, though $10 was the only cash sum ever paid. The owners were given credit on the books of the new company for their wires. The office was on the corner of Grove and Main streets. The Hartford system worked successfully that winter; so in the Spring of '79 Mr. Frost and Mr. Coy went to Springfield to start a company there. At the outset he found himself beset with difficulties. The Western Union Telegraph Company, which was at that time actively engaged in fighting the Bell Telephone Company with the Phelps telephone, and had a popular young man there who was meeting with good success. Heroic measures must be adopted at once. It was decided to solicit subscribers, promising them not to charge them anything until 100 subscriptions had been secured. The first man approached was the late Samuel Bowles, of the Springfield *Republican*.

Mr. Frost said: "Mr. Bowles, I want to take your order for one of our company's telephones."

"You haven't got your company started yet, have you?" inquired Mr. Bowles.

"Oh, yes I have," replied the indomitable Frost. "I've come to you for an order for a telephone."

"What good will that do me? I wouldn't have anybody to talk to."

"Oh, yes, you'd have us to talk to down at our office."

"But that wouldn't be an object to me."

"Yes, but it would be quite an object to us. We won't charge you anything until we get a hundred subscribers," was Mr. Frost's reply.

Mr. Bowles gave him an order right away and in an astonishingly short time the other 99 were secured, $22 a piece being the subscription price for them. Thus was the Western Union man defeated. Later, Holyoke was invaded and the two cities, 11 miles apart, were connected and the "long distance wire," for it was a long distance then, worked satisfactorily.

Affairs were progressing very smoothly, when, in May, rumors reached their ears of an attempt of the Hartford stockholders to get control of the company. They already owned over $10,000 and if they could secure the balance of the New York stock, about $12,000, which was in the possession of the Automatic Fire Alarm Company, they would be successful. If they did this there would be great danger of the Western Union Company getting in and gobbling up the entire concern, for they had hired away Special Agent Hayward and he was now working might and main for their interests. The $12,000 of New York stock could be bought for $6,000 cash. Mr. Coy held a conference with General Manager Vail, of the Bell Telephone Company, and they found on comparing notes that they could not raise that sum between them. Think of it! The now all-powerful Bell Telephone Company not even able to raise $3,000 twelve years ago.

In May a special meeting of the Connecticut District Telephone Company was held in Hartford. The Hartford stockholders were on hand in full force and they had a proxy representing the New York stock, who voted with them every time. They took charge of affairs forthwith and voted to increase the directors from three to 11. They openly boasted that they didn't want Frost in the affair, but they condescended to say that they would retain Coy if he would work cheap enough. The annual meeting was to be held in a month and then the Hartford people would have control fully. Mr. Frost was much downhearted when he left the meeting. So was Mr. Coy, but Morris F. Tyler, their lawyer, who was with them, cheered them up with the statement, "We'll find some way to get out of this yet." This was the first time that Mr. Tyler, who is now the president of the Southern New England Telephone Company, appeared on the scene. He owned $100 worth of stock, which had been given to him for the legal services necessary in the organization of the company. When Mr. Tyler drew up the paper of the new company he was offered $500 worth of the stock as his fee, Frost and Coy telling him that was all they could pay.

"I think $100 worth will be enough," said Mr. Tyler, and he was given that amount of stock.

But to continue the narrative. A few days after the meeting, Special Agent Hayward made Frost and Coy a par offer for their stock, though it was not worth more than $50. He made these overtures several times, but each time he was refused. Both men did not intend to relax their hold upon the company without a fight. Frost went to New York and Coy to Springfield. Frost made efforts to secure the $12,000 worth of stock owned by the Automatic Fire Alarm Company. He found that the Western Union Company had offered $6,000 for the stock.

"I'll give you $6,500," said Frost, "and will pay you $500 now for an option in writing until to-morrow afternoon at three o'clock." This was agreed to, and Frost immediately drew his check for $500 on the firm of Bunnell & Scranton. Then he retired to a hotel to sleep. About midnight he was aroused by Coy, who had finished his mission in Springfield and had come straight on to New York to assist his partner.

"What have you done?" asked Coy.

"I'll tell you in the morning," sleepily responded Frost.

"No, I want to know now," said Coy.

"Well, then, I've got a written option of the stock for $6,500, and have given them a check for $500 on Bunnell & Scranton to bind the bargain until to-morrow afternoon at three o'clock."

"You did, did you," said Coy. "Well it's lucky that you told me to-night. Don't you know that you haven't got a cent to your credit at Bunnell & Scranton's? They will send the check to New Haven the first thing in the morning and when it is not honored then you will forfeit your option. I'll telegraph at once to have $500 transferred from my account to yours." Coy did this as he said and then retired to sleep.

In the morning bright and early they were up and ready for business. Coy telegraphed up to the New Haven telephone office directing the man in charge to break open his desk, take out the company's stock book and send it down to them by the 9.30 train. In the meantime Frost's check arrived at Bunnell & Scranton's bank before Coy's telegram directing the transfer of cash was received. But fortunately the bank honored the check, though doing so at their own risk. When the Western Union Company learned that Frost and Coy had beaten them by $500 they were much chagrined and approached Frost with all sorts of overtures and promises, but in reality doing nothing. They wanted to delay him until after three o'clock when they would jump in and buy the stock themselves. They kept up the delay all the forenoon and, finally, about one o'clock, Coy said: "I've got the stock book here and if they don't talk business let us go down to Jay Gould and see what he will do for us. So a final effort was made with the Western Union which proved unavailing. Then they went down to Jay Gould's office. He was then building the American Union Telegraph Company and had no voice in the affairs of the Western Union. In fact, he was not even a director then. Frost sent up a note to the Automatic Company requesting an extension of time until four o'clock, which had been granted. It was shortly before three o'clock that they were ushered into Gould's office. Mr. Gould came in and said:

"What do you want me to do for you, gentlemen?"

Frost spoke up: "We want you to purchase $22,300 worth of our telephone stock, at par."

"This isn't worth more than 75 cents on the dollar, I suppose," replied Mr. Gould, drily.

"I don't know as it is," said Mr. Frost, "but we have got a 'corner' on it."

Gould smiled his ghastly smile and consented to take the stock, more because he saw, as they stated the case to him, that he could get a blow, though a small one, then, he thought, at the Western Union Company. The stock book was produced and the stock, which, by the way, had never been written out before, was made out and given over to Mr. Gould, for which he returned two checks, one of $6,000 and the other for $16,300. The first check was sent post haste to the Automatic Company just in time to close the bargain and buy out the stock.

Though much elated over their success, the two men were not so overjoyed but that they were reminded of their stomachs. They hadn't had a thing to eat all day. It was proposed that they take dinner, and a journey was made to the Park Avenue Hotel, where they attended to the wants of the inner man. As Coy paid the bill he noticed that his supply of ready cash was exceedingly limited, and as they were sitting in the hotel corridor smoking, he ventured to remark:

"You'll have to pay our fares, however."

"Can't do it," responded Frost, "haven't a cent of cash left."

"Neither have I," said Coy, and then they stared at each other. Finally, Frost said: "Oh, we'll get home sure enough, but we'll have to walk to the depot."

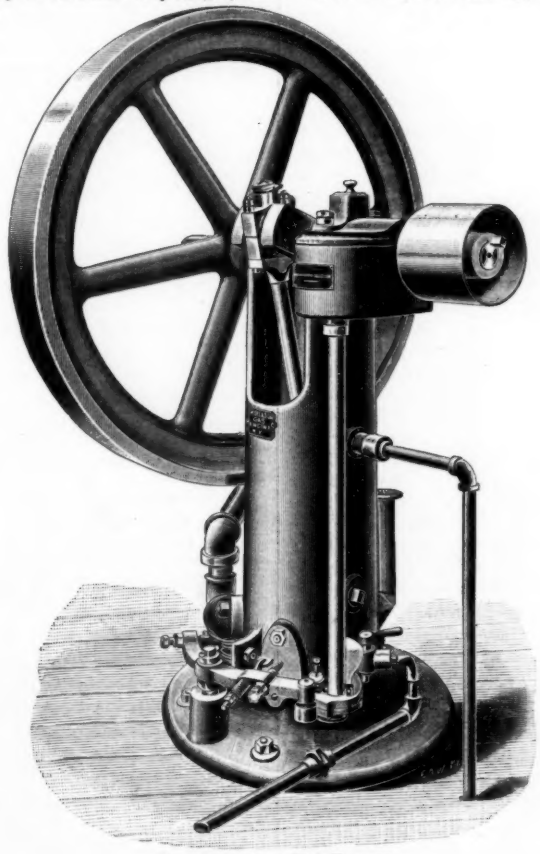
They walked to the Grand Central and had barely got inside when they met L. B. Hinman. The sight of a New Haven face filled them with joy. "Lend me $5," said Coy, after the first greetings were over. The $5 was forthcoming immediately and with it tickets were bought for New Haven.

The following morning they presented the check of Jay Gould at Bunnell & Scranton's for deposit, where it was received with a great deal of curiosity, not unmingled with veneration.

They were all ready then for that annual meeting at Hartford. The matter was kept very quiet. No one in Hartford knew of it except Lawyer Jones, and it is related that although he was himself hit by it, he laughed heartily and thought of what a good joke it would be on the other fellows. At the meeting Jay Gould sent up a young man named Plumb with a proxy. The Hartford stockholders were outvoted. Jay Gould, Russell Sage, Sidney Dillon, Mr. Bates, Mr. Plumb, and Frost and Coy were elected directors, a sufficient number to control the company. The Hartford stockholders were, of course, mortified and chagrined at the *coup d'etat* played upon them.

After finishing this work Frost and Coy thought they had worked this field as successfully as they could and determined to branch out in another venture in Pittsburgh. Coy resigned, but Frost changed his mind and remained in the company, the Pittsburgh project falling through. At that time neither of the gentlemen had any idea of the possibilities of the telephone.

But in November, 1879, the Bell Telephone Company made a satisfactory settlement of a suit which they had brought against P. A. Dowd, of Boston, an agent of the Western Union Company, who was pushing the Phelps telephone on the market. A contract was made between the two companies whereby the Western Union agreed to abandon the telephone field, provided that the Bell Telephone Company would not do any telegraph business over their wires, send no news, no market reports, no messages over 15 miles and do no business by messengers. After this contract Bell telephone stock rose rapidly, prices for the telephones were raised and the receipts coming in were enormous. And right here originated the now famous dispute between the Western Union and the Bell. The contract above referred to had a clause in it, in which the Bell agreed to pay the Western Union 20 per cent. of their gross receipts. Soon after the contract was made, the Bell made new contracts with the local companies, charging from 35 per cent. to 49 per cent. of their stock, and $14 per year for every telephone put in. A friendly suit was started between the Western Union and the Bell, as to whether the former should have 20 per cent. of the new stock which the local companies issued or 20 per cent. of the dividends. Of course, the Bell claimed the latter. This suit, with only a small amount at stake at first, has grown now to such dimensions that the contest is anything but friendly. It hasn't been settled yet.



THE ROLLASON GAS ENGINE.

The Globe Company.

The Globe Company, Cincinnati, has sent out its 1892 calendar. It is an exact miniature *fac-simile* of the company's cabinet indexes and is, therefore, suggestive of the business it is intended to advertise. The scheme is a neat one.

The Law Telephone Company's Stocking.

The Law Telephone Company, New York, have sent to their friends a large stocking on which is printed a cut of the famous Law battery, accompanied by the following request: "Kindly hang our stocking where it will not get left, and when stuffed full with Law battery orders, return it to 85 John street, New York. We shall 'sit up' till it comes."

Another Brownie Book from Merchant & Company.

Merchant & Company, that enterprising Philadelphia firm, have issued a new Brownie book. It is called "What Visitors Will be Shown at the World's Fair by Merchant & Company's Brownies." The pictures are well designed and splendidly executed. The antics of the little men are in keeping with the title, and the advertising of Merchant & Company's wares, metals and electrical goods, is cleverly interwoven.

The Rollason Gas Engine.

Of late years the demand for power in small units has led to the development of several types of gas engines. Among these is the Rollason, manufactured by the Electric Manufacturing and Gas Engine Company, of Greenbush, N. Y. The New York warerooms of this company are at 134 Liberty street, where Mr. H. W. Harris is in charge as general sales agent. Many isolated electric lighting plants are using these engines with signal success.

A Rollason gas engine, similar to the one illustrated herewith, was recently installed in a Brooklyn establishment in place of a steam plant. The services of an engineer at $720 per year were immediately dispensed with. The engine runs satisfactorily with the very little attention required.

The operation of the Rollason engine is briefly as follows: Supposing an explosion to have just taken place, the piston makes a forward stroke under its impulse; the exhaust valve is then opened, and the piston returns, expelling a large proportion of the products of combustion. During the next forward stroke the piston draws in behind it a scavenger charge of air, which it forces out on the back stroke. On the fifth stroke a combustible charge of gas and air is drawn in, and on the sixth is compressed ready for ignition, thus completing the cycle, which includes an explosion every three revolutions, except when the engine is working at very low powers.

KINDRED INTERESTS

Charles Ward, Charleston-Kanawha, W. Va., manufacturer of the Ward steam boiler, has issued some very convincing printed matter referring to his boiler.

The Eureka Tempered Copper Company, North East, Pa., have issued a neat little pamphlet called "Long Stories Boiled Down for Busy Men." It contains brief testimonials as to the merits of Eureka pure tempered copper. Send for it.

The Central Electric Company, Chicago, report, since taking the agency for the Interior Conduit and Insulation Company, that they have secured an order for 50,000 feet of one size tube. It certainly can be said that they have started in well.

The Viaduct Electric Company, Baltimore, has gotten out a neat advertisement. It consists of a pasteboard box containing three good lead pencils stamped as follows: "Compliments of the Viaduct Electric Company, Baltimore, Md." The REVIEW acknowledges the receipt of this novel advertisement.

H. W. Seller, Electrical Exchange, New York, inventor of the Seller water tube boiler, has perfected arrangements with the Watertown, N. Y., Steam Engine Company, whereby they will manufacture the Seller boiler. This company is now at work upon a 350 horse-power Seller boiler for the Metropolitan Museum of Art.

The Wilmot and Hobbs Manufacturing Company, Bridgeport, Conn., have sent out a neat two color pamphlet containing information about their famous cold rolled strip steel. The variety of articles which can be economically made from this steel is almost infinite. This company furnishes its regular patrons with a neat, hardened, tempered and nickel-plated steel rule.

The following testimonial letter has been received by the Burton Electric Company:

Allentown and Bethlehem Rapid Transit Co., Allentown, Pa., Dec. 10, 1891.
Burton Electric Co., Richmond, Va.:

DEAR SIR—Please ship eight more electric heaters with switches, being the equipment for two cars same as we had before. They are giving excellent satisfaction and are liked by the patrons of the road much better than the stoves. Yours truly,

(Signed) A. H. HAYWARD, Supt.

The Detroit Electrical Works are doing such a volume of business that they have found it absolutely necessary to greatly increase their facilities, and are now building an extensive addition to their plant. This they expect to have ready for occupancy in about 60 days' time, and when completed it will enable them to almost double their present capacity. They will then be in a position to turn out about 500 railway motors per year in addition to their other regular work. The company report having just taken a contract for five more 30 horse-power motors for the People's Electric Street Railway Company, of Springfield, Ill.

The Chicago office of the Thomson-Houston Electric Company has just closed a contract with the Benton-Bellefontaine Railway Company, St. Louis, for the equipment of 30 cars with two motors each of their latest improved type, known as the W. P. or water-proof. The contract includes the furnishing of three 333 horse-power compound wound generators of the Thomson-Houston manufacture, and it is understood that the railway company will do everything that is required to make this installation model, complete and perfect in every respect. The Thomson-Houston Company have their electric railway equipment in exclusive use in St. Louis on the following roads: St. Louis and Suburban, Union Depot, Mound City, Missouri Railroad, Suspension Bridge and East St. Louis, and it is now generally conceded that St. Louis has more Thomson-Houston electric railway apparatus in use than any other city in the United States, with the single exception of Boston.

The Brush Electric Company, Cleveland, O., has made the following recent sales:

Brush Electric Light and Power Co., Cleveland, O., one 1,000 light incandescent machine; Evansville Gas and Electric Light Co., Evansville, Ind., one 1,000 light incandescent machine; Crystal Plate Glass Co., Crystal City, Mo., one 150 light incandescent dynamo; Commonwealth Iron Co., Commonwealth, Wis., one 30 light arc machine, 2,000 candle-power, and 16 lamps; Sioux City Cable Railway Co., Sioux City, Ia., one 600 light incandescent alternating machine; Thomas Taft, Cornwall-on-Hudson, N. Y., one 600 light incandescent alternating machine; C. Boettcher, Denver, Colo., one 65 light arc machine and fifty 2,000 candle-power lamps; Louis Sands, Manistee, Mich., one 65 light arc machine 2,000 candle power; United States Electric Lighting Co., Philadelphia, Pa., three 65 light dynamos 2,000 candle-power; Toledo Electric Co., one 65 light dynamo 2,000 candle-power; Fulton Worsted Mills, Fulton, N. Y., thirty 2,000 candle-power arc lamps; F. W. Matthiessen, La Salle, N. Y., one 50 light arc machine 2,000 candle-power; Vincent & Lair, Aledo, Ill., one 28 light arc machine 2,000 candle-power; Fred. Greisheimer, Chicago, Ill., one 45 light arc machine 200 candle-power and one 200 light incandescent machine; The Kittanning Electric Light, Heat and Power Co., Kittanning, Pa., one 50 light arc machine 2,000 candle-power and twenty 2,000 candle-power lamps; Edison Construction and Supply Department, Erie, Pa., one 45 light machine 2,000 candle-power; Cleveland Hardware Co., Cleveland, O., one 400 light incandescent machine.

The Ball Engine Company, Erie, Pa., have made recent sales as follows: Palace Hotel, San Francisco, Cal., one 200 horse-power cross compound; H. C. Hawks, Boston, Mass., one 35 horse-power single cylinder; The Linderoth Ceramic Co., Chicago, Ill., one 25 horse-power single cylinder; Ohio Baking Co., Cleveland, O., one 80 horse-power single cylinder; Lawrence Gas and Electric Light Co., New Castle, Pa., one 150 horse-power single cylinder; D. H. Goodnow, Fitchburg, Mass., one 35 horse-power single cylinder; Attica Electric Light Co., Attica, N. Y., one 80 horse-power single cylinder and one 50 horse-power; The Colonial Club, New York city, two 50 horse-power single cylinder; Citizens' Electric Light Co., Braddock, Pa., one 150 horse-power single cylinder; Youngstown Electric Light Co., Youngstown, O., one 350 horse-power cross compound; Pittsburgh and Birmingham Traction Co., Pittsburgh, Pa., one 50 horse-power single cylinder; California Electric Light Co., San Francisco, Cal., one 300 horse-power cross compound; Sauquoit Silk Manufacturing Co., Scranton, Pa., one 35 horse-power single cylinder; Claremont Electric Light Co., Claremont, N. H., one 80 horse-power single cylinder; Johnstown Electric Light Co., Johnstown, Pa., one 200 horse-power single cylinder; Abington and Rockland Electric Light Co., North Abington, Mass., one 100 horse-power tandem compound; Edison General Electric Co., New York, two 50 horse-power single cylinder; Wrought Iron Casting Co., South Boston, Mass., one 100 horse power single cylinder; Cleveland Hardware Co., Cleveland, O., one 50 horse-power single cylinder; Union City Electric Co., Union City, Tenn., one 80 horse-power single cylinder; Brush Electric Light Co., Cleveland, O., one 35 horse-power single cylinder.

IF YOU have anything pertaining to electric machinery you want to sell, send us the description.

IF YOU want anything pertaining to electric machinery, send us your inquiries.

FRANK RIDLON & CO.,
Dealers in New and Second-Hand
Electric Light & Power Machinery,
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ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENTS OF THE UNITED STATES WERE ISSUED ON DECEMBER 22, 1891.

465,444 Electric switch; Henry Barton, London, England, assignor to John Abbott Iliffe, same place.
465,447 Guard for trolley wire insulators; Francis O. Blackwell, Lynn, Mass.
465,469 Electric railway trolley; Charles S. Foster, Whitesborough, N. Y.
465,470 Globe holder for electric arc lamps; Horatio A. Foster, New York, N. Y., assignor to the Thomson-Houston Electric Co. of Connecticut.
465,501 Train signaling apparatus; Paul Synnestvedt, Chicago, Ill.
465,508 Cut-out for incandescent lamps; Herbert C. Wirt, Boston, Mass.
465,511 Electric snap switch; William S. Andrews, New York, N. Y., assignor to the Edison General Electric Co., same place.
465,512 Rheostat; William S. Andrews and Alfred K. Warren, New York, N. Y., assignors to the Edison General Electric Co., same place.
465,514 Electric arc-lamp; Henry P. Ball, Brooklyn, assignor to the Edison General Electric Co., New York, N. Y.
465,525 Electrolytic apparatus for treating metals; Edward S. Hayden, Waterbury, Conn.
465,548 Annunciator for the supposed dead; William H. White, Topeka, Kan.
465,564 Conduit for electric wires; Henry W. Johns, New York, N. Y.
465,592 Gearing for electric motor cars; Owen F. Evans, Columbus, O., assignor of one-fourth to William H. Slade, same place.
465,594 System of electrical distribution; Frederick A. La Roche, Philadelphia, Pa., assignor to the La Roche Electric Works and George H. Earle, Jr., same place.
465,602 Electric circuit closer for burglar alarms; William C. Thompson, Minneapolis, Minn., assignor to the Western Electric Co., Chicago, Ill.
465,613 Electric railway; William H. Applegate, Atlanta, Iowa, assignor to the International Electric Railway Co., Chicago, Ill.
465,618 Electric switch; Gwynne E. Painter, Baltimore, Md., assignor of one-half to James F. Morrison, same place.
465,648 Combined signal and telephone system; Thos. W. O'Brien, Wilkes Barre, Pa.
465,655 Independent electric clock; Walter J. Dudley, Somerville, Mass.
465,665 Hanging device for arc lamps; William K. Howard, Jr., Fredericksburg, Va.
465,684 Incandescent electric lamp fixture; Gustave E. Villaret and Victor E. Rondel, Philadelphia, Pa.
465,685 Electric arc lamp; Henry C. Waldecker, Austin, Minn., assignor to Winfield S. Pierce, same place, Samuel H. Pierce, Hudson, Wis., and Harry F. Batchelor, Miles City, Mont.
465,778 Adjustable support for telephones; Chas. H. Gatchell, Fredericton, Canada, assignor of one-half to Albert James Gregory, same place.
465,805 Means for turning on and off electric currents; Thomas C. Smith and Benjamin D. Acker, Philadelphia, Pa., assignors to Isaac C. Walker and Henry G. Kepler, same place.
465,806 Electric railway trolley; Frank J. Sprague and Patrick F. O'Shaughnessy, New York, N. Y., assignors to the Sprague Electric Railway and Motor Co., same place.
465,808 Dynamo-electric machine; René Thury, Geneva, Switzerland.
465,809 Electrical testing instrument; Richard Varley, Jr., Englewood, N. J.

JOHN A. BARRETT,
ELECTRICAL ENGINEER & EXPERT,
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